



United States Department of Agriculture

Economic
Research
Service

Economic
Research
Report
Number 262

March 2019

Working Lands Conservation Contract Modifications: Patterns in Dropped Practices

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United States Department of Agriculture

Economic Research Service www.ers.usda.gov

Recommended citation format for this publication:

Wallander, Steven, Roger Claassen, Alexandra Hill, and Jacob Fooks. *Working Lands Conservation Contract Modifications: Patterns in Dropped Practices*, ERR-262, U.S. Department of Agriculture, Economic Research Service, March 2019.

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Working Lands Conservation Contract Modifications: Patterns in Dropped Practices

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Abstract

Since 1996, USDA working lands programs have resulted in hundreds of thousands of conservation contracts—voluntary agreements between USDA and program participants. Within each contract, the participant agrees to install or implement a set of conservation practices, and USDA agrees to provide technical and financial assistance to the participant. The use of contracts is central to the programs because of the complexity of addressing conservation goals—many contracts have multiple practices—and because of the time lags involved in installing and implementing conservation practices. A large majority of practices on these contracts are installed as planned. This study examines data on the 10 to 20 percent of practices that participants who signed contracts in the Environmental Quality Incentives Program in fiscal year 2010 did not implement as planned and dropped from their contracts. We find differences in the frequency with which specific practices are dropped, as well as in the likelihood that some types of contracts have at least one dropped practice. These differences suggest participants earn different levels of private benefits from installing or implementing conservation practices, which results in varying incentives to complete practices. Examining patterns in dropped practices reveals these private benefits, which are generally not known by program managers at the time participants sign conservation contracts. In this report, we discuss the significance of unobserved private incentives in possible policy design options—changes in ranking criteria, restrictions on contract structure, use of bundled practices at varied cost-share rates, and changes to cost-share rates.

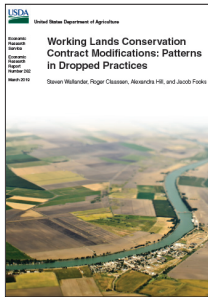
Keywords: Working lands conservation programs, deobligations, adaptive management, contract compliance, contract structure

Acknowledgments

The authors would like to thank the following individuals for technical peer reviews: James Rowe, USDA, Natural Resources Conservation Service; Chris Hartley, USDA, Office of the Chief Economist; Laura McCann, University of Missouri; Leah Harris Palm-Forster, University of Delaware; and one reviewer who requested anonymity.

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What Is the Issue?

Through agricultural conservation programs, including the Environmental Quality Incentives Program (EQIP), USDA contracts with producers for the voluntary application of conservation practices. Most conservation practices are completed as scheduled. Sometimes, though, contracts are modified, and agreed-on practices are either replaced or dropped from the contract. Since dropped practices mean financial assistance amounts must be reallocated, often years later, and plans revised, the USDA Natural Resources Conservation Service (NRCS), which administers EQIP, has a number of mechanisms in place to limit the frequency and types of contract modifications. The frequency with which different practices are dropped provides insight into how these mechanisms work; it also reveals a way of providing program managers with information about incentives for program participants to complete practices. A better understanding of the drivers of dropped practices could help NRCS with strategic planning and program design.

Why do some farmers and ranchers sign conservation contracts with USDA and then not implement all of the practices on those contracts?

- Practices may be dropped for reasons that can be broadly classified as “adaptive management,” a response to changing conditions or information. Over the life of a conservation contract, circumstances beyond the control of participants sometimes require modifications to the scope and timing of practice adoption. Since responding to unexpected circumstances is necessary in any contracting environment, adaptive management can be a desirable outcome for the program.
- Practices may also be dropped for reasons that can be broadly classified as “unrevealed private benefits,” not directly observable by NRCS staff and a challenge for any incentive-based, voluntary program. While most research on differences in private benefits suggests they influence degrees of willingness to participate in the program, the differences may also affect willingness to complete practices in a contract.

In this report, we address several questions related to dropped practices in EQIP. First, what evidence is there to suggest that dropped practices are associated with adaptive management? Second, what type of practices are most likely to be dropped from EQIP contracts? Are practices relatively low in farm benefits more likely to be dropped? Finally, does contract structure—size (in dollars or acres), number of practices, or contract length—affect the likelihood of dropped practices? Using data from EQIP contracts that were originally signed in fiscal year 2010, we explore these questions.

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What Did the Study Find?

For the 168,195 practices contracted through EQIP in fiscal year (FY) 2010, 78 percent had been completed (certified or partially certified) by the middle of FY 2014. About 8 percent had been scheduled for, or delayed to, 2014 or later. The remaining 14 percent of the original practices had been dropped.

About one-third of modification reasons on contracts with dropped practices are obvious cases of adaptive management, as indicated by recording of modification reasons such as “natural disaster” or “severe illness.” Frequently, though, the reasons for modifications are ambiguous and do not clearly indicate that practices were dropped in response to changing conditions or information.

We find that practices with indicators suggesting low farm benefits are more likely to be dropped from EQIP contracts than practices with likely high benefits. Since 60 percent of dropped practices are on contracts with at least one certified (completed) practice, differences in private benefits between practices may lead participants to seek permission to drop a low-benefit practice after completing one with higher farm benefits. Finally, the timing of practices also matters; those most likely to be scheduled in later years of a contract (in year 3 or later) are also more likely to be dropped than practices implemented in the first 2 years.

One of the major program design questions for voluntary conservation programs is whether unrevealed private benefits are inherent in the structure of contracts that program participants help to develop and are willing to sign and whether contract structure affects the likelihood that practices get dropped. Using very simple measures of contract structure, the analysis shows that participants with a larger (higher cost or higher acreage) contract or a more complex contract (more practices or more years) were ranked higher for enrollment. The number of years on a contract did not show a statistically significant impact on relative ranking. Since producers develop contracts through consultation with NRCS based on the natural resource concerns present on their farm, the link between contract structure and ranking indicates only the possibility that some participants may have included practices they planned to drop or replace in the future.

We estimate a model of how four simple measures of contract structure influence the likelihood of dropped practices, and we find that contracts with a larger number of practices on contracts are more likely to have a dropped practice. While this suggests reductions in the number of practices on a contract could reduce the number of dropped practices in the program, such restrictions could also potentially limit the ability of the program to address certain types of resource concerns.

How Was the Study Conducted?

The NRCS ProTracts database is used to manage contracts within EQIP and other working lands programs. For this study, data on fiscal year 2010 contracts were drawn from the database at two points in time: Data on the original contract specifications were pulled at the end of the 2010 fiscal year, and data on the later outcomes of the contracts were pulled during the spring of 2014. While EQIP contracts can be as long as 10 years, the large majority of contracts are 3 years or shorter, so most of the practices in the original contract specifications should have been completed by the spring 2014. The combination of the two datasets provides information on how the contracts were modified and which practices were dropped. A statistical model of the data using econometric methods provides the basis for estimates of the impact of contract structure restrictions on the frequency of dropped practices.

Working Lands Conservation Contract Modifications: Patterns in Dropped Practices

Introduction

For over 80 years, beginning with efforts to address soil erosion during the Dust Bowl era, the U.S. Department of Agriculture (USDA) has administered a variety of working lands conservation programs. These programs help farmers, ranchers, and other land managers address resource and conservation needs on land that remains in agricultural production. Most of these programs rely on contracts, agreements under which the participant voluntarily installs or implements a set of conservation practices and USDA provides technical and financial assistance.

The most common conservation practices involve changes to the production system such as adjustments in the application of fertilizer and other nutrients, a shift to integrated pest management, and planting of cover crops; structural changes to land such as fences that keep livestock out of sensitive areas or livestock waste storage systems; and changes in irrigation technology. Conservation practices provide a mix of public and private benefits, sometimes referred to as “off-farm” and “on-farm” benefits, respectively. Examples of public off-farm benefits include improved water quality, wildlife habitat, air quality, and soil carbon sequestration. Examples of private on-farm benefits include reduced fertilizer requirements, higher average yields, reduced soil compaction, lower input costs, and fewer problems with weeds and pests. Financial assistance payments are designed to encourage adoption of practices that provide off-farm, public benefits or assist producers in complying with environmental regulations, and on-farm benefits are generally an incidental consideration from the perspective of the program.

In this report, we examine data on conservation practices within USDA’s Environmental Quality Incentives Program (EQIP). In the 1996 Farm Act, Congress established EQIP by consolidating and updating earlier working lands programs. More than previous programs, EQIP focused on a broad range of conservation and environmental issues, including water quality, wildlife habitat, and air quality in addition to a more traditional focus on soil conservation and soil quality. Since 1996, farmers and ranchers have signed more than 600,000 EQIP conservation contracts, specifying more than 3 million conservation practices, and obligating over \$12 billion in financial assistance.

A large majority of EQIP practices are implemented as planned. We estimate that over the life of the program, between 80 and 90 percent of the 3 million practices have been implemented as originally specified or replaced with a comparable practice. Our focus in this report is the 10 to 20 percent of practices that are not implemented as planned. We refer to these as “dropped practices” and investigate participants’ likely motivations for dropping practices

Reducing the number of dropped practices could make EQIP more cost effective. As part of the 2015-2017 strategic plan, NRCS implemented a performance metric called the Conservation Implementation Ratio (CIR), which tracks the share of conservation that gets implemented per the original contracts, and set CIR targets of 88, 89, and 90 in 2015, 2016, and 2017, respectively. A higher CIR generally indicates that NRCS is addressing a greater share of the program’s conservation objectives in a timely manner. In addition, a higher CIR indicates a reduced demand on NRCS

to reobligate unused funds and engage in the additional technical assistance that goes with such reobligations. A better understanding of the drivers of dropped practices could help NRCS with future strategic planning and program design.

EQIP is a complex program dealing with dozens of different conservation goals across a wide range of agricultural enterprises and environmental conditions. Due in part to this complexity, there are many reasons that program participants seek NRCS permission to modify conservation contracts and drop practices. For this study, we divide these reasons into two broad categories: adaptive management and unrevealed incentives.

Adaptive management is the modification of contracts in response to changing conditions, including weather (e.g., severe drought), unexpected costs of installing practices, or new information about resource concerns on a field due to changes in plant, wildlife, or other on-the-ground conditions. Often program participants and NRCS conservationists face unforeseen circumstances in the years after contracts are signed. Adaptive management, the flexibility to modify contracts in these cases, is crucial to ensuring that the program responds appropriately to changing information and to maintaining trust between producers and NRCS, which is important for producers' initial willingness to enter into contracts.

Unrevealed incentives arise in voluntary conservation programs because the private, on-farm benefits of practice adoption cannot be fully observed by NRCS staff. While the program is based on carefully constructed estimates of the average costs or net benefits of every conservation practice, the on-farm benefits can vary across farms and even across the land within a farm. A stylized example with three different farms (table 1) illustrates how farms with different costs and benefits have different unrevealed net benefits. In this example, all three farms have negative net benefits without assistance and positive net benefits after receiving assistance. Most conservation practices provide a combination of on- and off-farm benefits.

Table 1

Stylized example of unrevealed incentives for a conservation practice

Cost type	Private benefits without financial assistance			Financial assistance	Private benefits with financial assistance
	Cost*	Benefit	Net benefit	Payment*	Net benefit
High	\$50	\$32	(\$18)	\$20	\$2
Average	\$40	\$27	(\$13)	\$20	\$7
Low	\$30	\$25	(\$5)	\$20	\$15

* Costs may be partially revealed when practice implementation results in receipts for materials.

*Payment rates are typically set at 50 percent of the average costs. The benefits are assumed to be unobserved, which makes the net benefits unrevealed incentives.

Source: USDA, Economic Research Service calculations based on Natural Resources Conservation Service ProTracts data.

Some practices have sufficiently high on-farm benefits to make financial assistance unnecessary for some farms. Conservation tillage, for example, has been adopted by many producers without financial assistance, while other producers have not adopted the practice even when assistance is available. This illustrates one of the central challenges for voluntary conservation programs: how can a program ensure that incentive payments go only, or at least predominately, to individuals who would not have adopted a practice anyway? (Claassen et al., 2014). These challenges are not unique to EQIP, and the challenge of unrevealed incentives, often referred to as information asymmetry, confronts essentially all voluntary conservation programs (Ferraro, 2008).

Based on these broad descriptions of adaptive management and unrevealed incentives, this report seeks to answer the following questions:

- Is it possible to identify when practices are dropped as adaptive management?
- Do patterns in which practices are dropped suggest that unrevealed incentives vary across practice types?
- Would restricting the size or complexity (structure) of contracts reduce the rate of dropped practices?

The Conservation Process Proceeds From Farm Bills to Contracts

We frame the timeline from Farm Bills to implemented conservation practices as a five-step conservation process (fig. 1).¹ The implementation of conservation practices—or the decision to drop those practices from a contract—occurs at the final stage of a long planning and contracting process. Much of what happens at the implementation stage depends upon prior decisions made by program participants, by USDA, and even by lawmakers.

Step One: Rulemaking

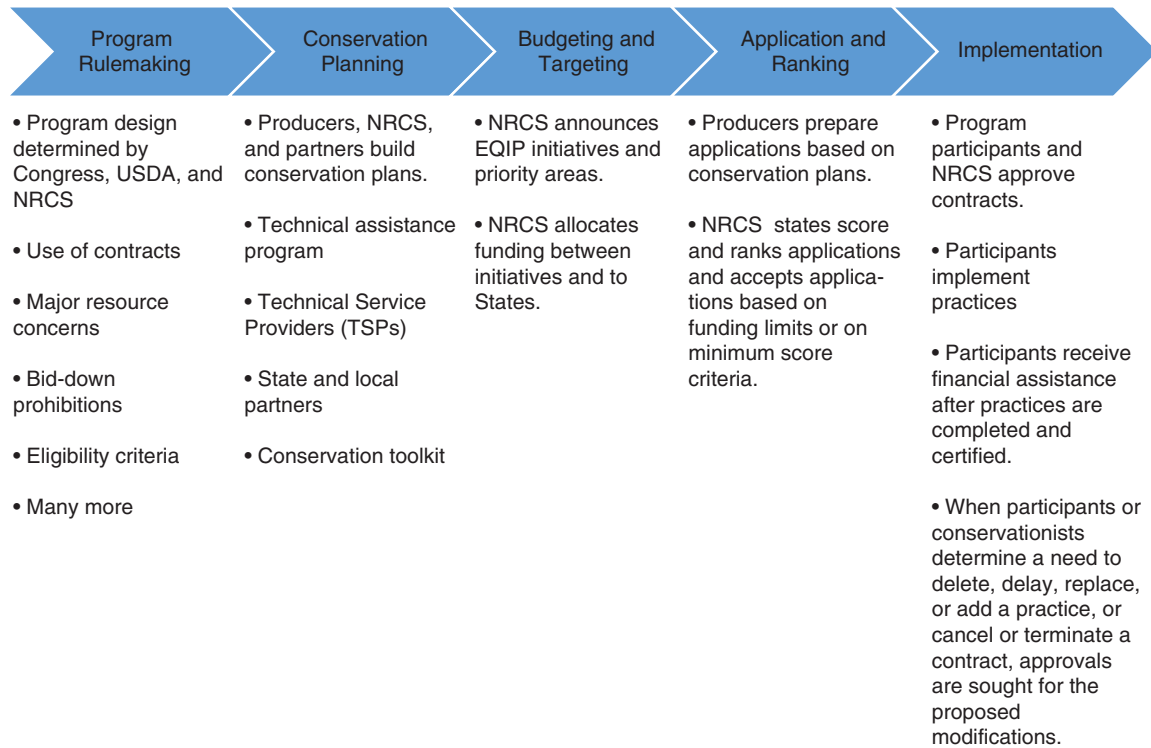
The first action is program design, a combination of decisions made by Congress as part of the Farm Bill, or by NRCS as part of the rulemaking that follows the signing of each Farm Act. EQIP was first authorized in the 1996 Farm Act and has since been amended and reauthorized in the 2002, 2008, and 2014 and 2018 Farm Acts. While the essential function of the program—to encourage producers to adopt or install conservation practices—has remained constant, each legislative cycle has resulted in changes to the funding levels, broad program priorities, rules for allocating funds across States, and how contracts are selected.

Some Federal incentive programs do not rely on contracts (e.g., tax credits for investments in energy efficiency), but within conservation programs the use of contracts is a standard approach. Many water quality trading programs and habitat banking programs function in a fashion similar to EQIP (Ribaud, 2008). Contracts are also found in many other aspects of farming. For production of crops and livestock, producers and buyers rely on marketing or production contracts for about 35 percent of the total value of production (MacDonald, 2017). Regardless of the setting, contract negotiations often require significant costs and must cope with unrevealed incentives.

¹ This process is a bit more broadly defined and condensed than the NRCS descriptions of the “steps to assistance.” (<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/newsroom/features/?cid=stelprdb1193811>) or the “planning process.” (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/nh/technical/cp/?cid=nrcs144p2_015695).

Figure 1

Conceptual map of the NRCS conservation process for establishing EQIP contracts



EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service conceptual framework developed from review of Farm Acts, Natural Resources Conservation Service (NRCS) handbooks, and USDA program materials.

EQIP contracts specify practices based on standards and specifications that NRCS develops during this rulemaking step of the conservation process. The extensive list of practice standards reflects the widely varying landscapes, climates, and agricultural production systems across the areas served by NRCS working lands programs. In the 2010 fiscal year, 180 different types of practices received funding through EQIP. EQIP contracts can involve multiple conservation practices to be implemented or installed over multiple years.

Step 2: Conservation Planning

The later steps of the conservation process would not function well without the conservation planning step, which relies on both the NRCS technical assistance program and NRCS partners such as soil conservation districts or technical service providers. The planning step is essentially a discovery process in which the producer and USDA identify areas of common interest. It ensures that conservation plans, as well as any EQIP contracts based on those plans, address the resource concerns outlined in the Farm Act. NRCS, or the conservation partner, works with a producer to develop a conservation plan that identifies resource concerns on the farm or ranch and prescribes practices that address those concerns. Resource concerns are specific broad categories of conservation outcomes, such as livestock waste management, soil erosion control, wildlife habitat development, or water conservation. A single conservation practice may address multiple resource concerns.

The complexity of some conservation contracts often results because the underlying resource concerns for a given farm or ranch are complex.

Step 3: Budgeting and Targeting

This step is carried out through the use of initiatives and priority areas. EQIP operates as a collection of many small initiatives. NRCS—at the National, State, and local levels and in collaboration with local work groups and State Technical Committees—establishes priority resource concerns that determine which resource interests to focus on in a given area. The Farm Act places some broad constraints on how this process must balance overall objectives. For example, the 2014 law specifies that at least 60 percent of total EQIP funds shall go toward livestock production and at least 5 percent of funds toward wildlife habitat (16 USC 3839aa2).

Step 4: Application and Ranking

Once the EQIP initiatives in a given area have been defined, producers can, in consultation with NRCS, select practices from their conservation plans to include in an application for financial assistance under a specific initiative. Applications are accepted year-round, but each State establishes application-ranking periods. At the end of each period, applications that meet eligibility requirements are reviewed and evaluated for funding through the “application environmental ranking tool.” Applications that are accepted by NRCS following this process become binding contracts between USDA and the producers. Frequently, the total financial assistance requested by producers is greater than the total funding available for a given initiative. When this happens, all eligible applications are funded in order of ranking as long as they meet a minimum threshold ranking score set by the State. Scoring and ranking mainly serve to identify the contracts with the highest benefits within initiatives.

Box: Ranking, Scoring, and Auctions in Conservation Programs

The 2002 Farm Security Act significantly changed the way applications were ranked and the way funds were allocated within the program. The most important of these changes was the provision that USDA could no longer rank applications based on “bidding down.” Prior research on EQIP found that in the early years of the program, producers included “no-cost” practices to improve their application ranking, only to later drop many of those practices from their contracts (Cattaneo, 2003). Since the 2002 Farm Act, applications to the program can no longer be assigned a higher priority if they offer to accept reduced financial assistance unit costs. Instead, practices are now funded at a fixed payment rate for each practice, and offers are ranked based only on differences in conservation benefits.

While “no-cost” practices are no longer allowed (or rewarded) in the program, scoring and ranking in some circumstances still rewards producers for including more practices with more public benefits. Producers may have incentives to include certain practices on their applications that—while not as extensive as under no-cost bidding (e.g., Cattaneo, 2003)—may increase the chances that their application will be accepted, provided that their conservation plan gives them an option to do so. The bidding-down ranking used prior to the 2002 Farm Bill was like an auction where producers competed based on price bids (though not on all practices). The application-ranking process can be seen as a similar auction where producers compete

by raising their score instead of lowering their price. Producers can enhance their chances of getting an EQIP contract by selecting the highest scoring subset of practices from their conservation plans. Prior research has shown that the complexity in the ranking and scoring process, while critical for effective targeting, can deter program participation (Palm-Forster et al., 2016; Reimer and Prokopy, 2014).

Auctions are an important tool for addressing unrevealed incentives (Cason and Gangadharan, 2004). Scoring functions in an auction can interact with the payment mechanisms to influence producers' willingness to participate in programs (Zilberman and Segerson, 2012; Segerson, 2013; Stubbs, 2010; Hanley et al., 2012; Engel, Pagiola, and Wunder, 2008). Eligibility criteria that seek to limit programs to low-cost or high-benefit applications are another policy tool, but they can interact in unexpected ways with ranking or auction mechanisms (Babcock et al., 1997). Another tool for dealing with information asymmetry is offering a variety of contract designs that will have different appeal to different types of producers (Ferraro, 2008). Comparisons between the U.S. and European Union agricultural conservation programs show that there are many ways to set up these mechanisms (Baylis et al., 2008). EQIP includes all three design components—eligibility criteria, a quality-differentiated, auction-like ranking mechanism, and a variety of contract structures. However, as noted, these designs tend to be structured to reflect differences in benefits across offers rather than to address differences in opportunity costs that arise from the unrevealed incentives problem.

Step 5: Implementation

This is the final step in the conservation process. Once the contract is signed by NRCS and all supporting documents are completed by the participant, NRCS field staff work with the participant to ensure that practices are installed or adopted according to NRCS standards and specifications. Once a given practice is certified as properly installed or implemented, the farmer receives the financial assistance associated with that practice. In a contract with multiple practices, this often involves iterations of installation, certification, and payment. This is the step in the process at which some practices get dropped from contracts, as described next.

The Process of Dropping Practices

In administering EQIP, NRCS has developed protocols for addressing both unforeseen circumstances and contract noncompliance.² Administratively, there are three different ways in which a practice can be “dropped.” In much of this report, we analyze all dropped practices together because adaptive management and unrevealed incentives are at play in all three cases; however, in some situations the differences are important.

² The rules and guidelines for how field offices handle contract modifications are contained in the Conservation Programs Manual, the Document Contracting Manual, and the EQIP-specific Conservation Program Manual. These documents give guidance on administering all stages of the contracting process, from application to the program to regular implementation of contracts to making changes in contracts. <http://directives.sc.egov.usda.gov/ViewerFS.aspx?hid=34627> Title 440 Conservation Programs Manual, Part 512, Conservation Program Contracting, and 440 Part 515, Environmental Quality Incentives Program Manual.

In the program administrative data, contracts and practices have status codes that change over time. After being accepted into the program, a contract can have one of the following status types:

- Active: Approved by NRCS, signed by the farmer, and having at least one uncompleted practice.
- Completed: All practices on the contract are certified and financial assistance has been paid.
- Cancelled: The entire contract is cancelled, generally at the request of the farmer, with approval from NRCS. All practices that are not yet certified are cancelled.
- Terminated: NRCS terminates the contract, often for noncompliance. All practices that are not yet certified are terminated.

Practices within a contract are tracked similarly. Once a contract becomes active, each practice can take on one of six status types. Three of these types capture the different ways that a practice can be dropped:

- Cancelled: On a cancelled contract and not certified prior to cancellation.
- Terminated: On a terminated contract and not certified prior to termination.
- Deleted: Removed by agreement between NRCS and the participant; may be replaced by a new practice, and contract remains active for any other planned practices.

The other three types of practice status capture practices that either have been completed or are expected to be completed in the future.

- Planned: the default status for an uncompleted practice.
- Certified: completed and checked by NRCS.
- Partially Certified: checked but needing additional work to be completed.

Deleted practices are jointly agreed to by NRCS and the farmer. As per the *Conservation Programs Manual* (USDA 2018), “To delete any contract item, there must be a valid reason not adverse to the Government’s interest and conservation objectives.” The designated conservationist must certify on Form NRCS-CPA-1156, Revision of Plan/Schedule of Operations or Modification of a Contract, that the application ranking score was not adversely impacted by a deletion. Contract items ‘may not be deleted simply to avoid a potential contract violation’ (Title 440 Section 512.50 D (iv)). The manual goes on to state that deletions are appropriate when the original practice is not technically feasible or when it no longer addresses the resource concern.

For cancellations, producers might request a contract cancellation due to a reason such as financial hardship. As stated in the *Conservation Programs Manual*, “a cancellation is an equitable remedy that allows both parties to the contract to end the contractual relationship” (512.57 A (i)).

Termination of contracts and practices occurs at the request of NRCS and is the signal of some form of noncompliance with the terms of the contract. As stated in the *Conservation Programs Manual*, termination can occur “as a result of a material breach of the terms and condition including in the [contract]” (512.27 A (ii)). A variety of prior studies, mostly theoretical, have focused on this broad issue of compliance, often with a focus on trying to identify optimal enforcement efforts (Fraser, 2012; Christensen et al., 2011; Yano and Blandford, 2009; Herzfeld and Jongeneel, 2012; Hart and Latacz-Lohmann, 2005; Giannakas and Kaplan, 2005).

When contracts are cancelled or terminated or when practices are deleted, NRCS rules allow for NRCS to recover liquidated damages and recoup any financial assistance payments that had already been paid on the contract. This mechanism suggests that for cases where EQIP is facing true contract noncompliance, there is considerable enforcement authority.

Overview of Empirical Approach and Data

For this analysis, we examine modifications made to the EQIP contracts that were awarded in fiscal year 2010. A single-year cohort was selected to keep the analysis tractable and to avoid making false conclusions on modification rates from changes in how modifications have been tracked over time. About 97 percent of the practices on these contracts were originally specified to be implemented or installed between 2010 and 2013. So when the data on modifications were collected in the spring of 2014, the fiscal year 2010 contracts were distant enough so that almost all of the practices would have been implemented as planned, dropped from the contract, or delayed. While earlier fiscal years would have had an even larger share of practices falling into these categories, the 2010 contracts were recent enough to largely reflect the EQIP program as it currently exists, with a few, mostly minor, exceptions.

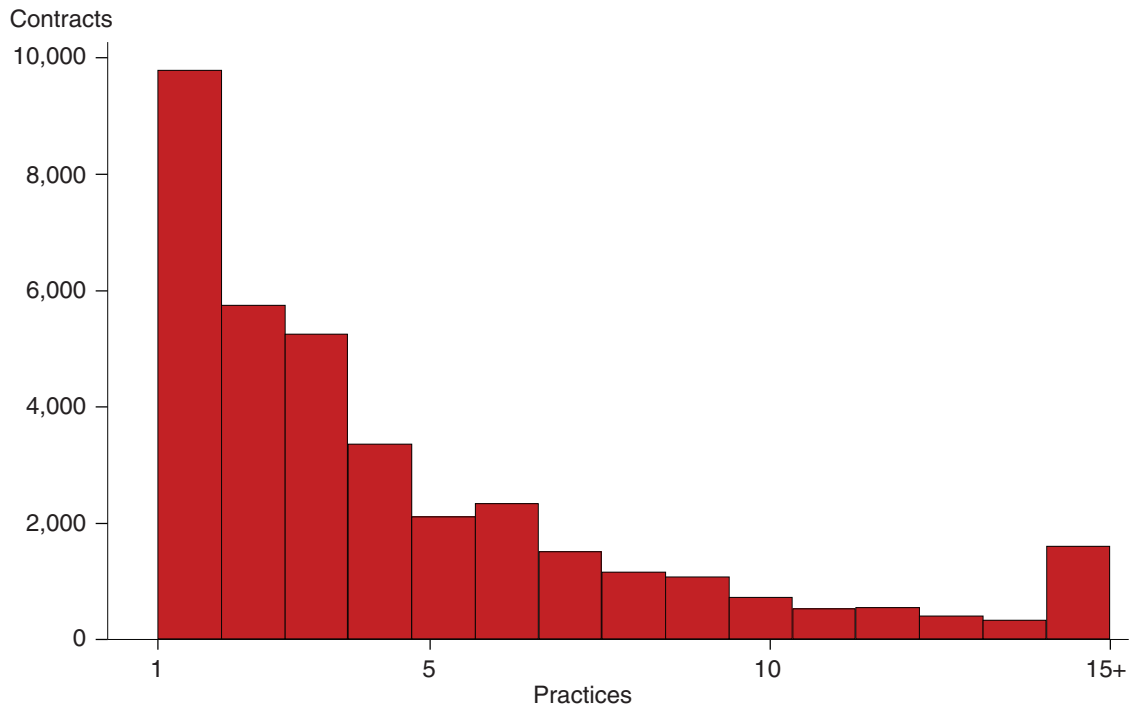
Most contracts are relatively small. The median contract in 2010 was \$2,700. Seventy-five percent of contracts were \$6,183 or less. A limited number of very large contracts cause the average to be a bit higher, with the mean contract at \$7,128. The distribution of contract size in terms of acres, when measured by the total treated acres reported for each contract, looks similar. The median contract treats 65 acres, and 75 percent of contracts are for 176 acres or less. Again, a number of very large contracts pull the average size higher, in this case to 357 acres.

Similar to contract size, the distribution of contract complexity is skewed toward simpler contracts, with fewer practices and shorter contract length. Two-thirds of 2010 contracts have four or fewer practices (fig. 2). The median contract has three practices. Due to some very complex contracts, the mean contract, at 4.6 practices, is larger than the median. A bit over 4 percent of contracts have 15 or more practices. (Note that, for this calculation, each instance of a practice is counted separately. So a contract with three different no-till practices on the same field in consecutive years would count as a contract with three practices. In that way, this measure is something of an overstatement of contract complexity.) The distribution of the years on a contract looks similar to that for practices. Almost half of contracts are for only a single year, and more than 90 percent of contracts are for 3 or fewer years.

These differences in contract structure and size are an important aspect of the program design, since they arise from the interaction of program rules and the planning and contract negotiation processes. Some of the differences in contract structure will be central to the analysis that follows.

Figure 2

Frequency of practices per EQIP contract for fiscal year 2010 contracts



Source: USDA, Economic Research Service calculations from ProTracts data. Contracts with more than 15 practices are truncated at 15.

Adaptive Management Is Responsible for Some Dropped Practices

For this chapter, we investigate the most basic administrative data on EQIP contract changes—practice status, contract status, and stated reasons for contract modifications. We begin by looking at the contract data for clear evidence of adaptive management, which is often directly observable and clearly recorded in the administrative data. While program rules require that all contract modifications are approved and justified, in some cases the justifications given in the administrative data do not provide sufficient evidence of adaptive management.

Key Definitions and Methods

We define adaptive management as a change in a contract that has two features. First, adaptive management arises in response to a change in conditions after the contract was originally signed. The change in conditions—such as weather, prices on key inputs, or improved information regarding site conditions and resource concern—alters the public and private benefits of proceeding with the contract. The second defining feature is that adaptive management is mutually beneficial to both parties to the contract, in this case NRCS and the producer. As noted above, NRCS has technical adequacy requirements for contract modifications to ensure that public benefits are maintained.

A simple, clear-cut example of adaptive management occurred with contracts that included the practice of installing steel irrigation pipe. Given an unexpected rise in the price of steel in 2011, many contracts were modified to replace the steel pipe practice with a comparable plastic-pipe practice.³ In this example, an increase in the private cost of installing the practice made the original practice undesirable, and a comparable, lower cost alternative that produced the same public benefits was available. These modifications were clear reactions to changing conditions and were clearly mutually beneficial.

In contrast, consider the example of a contract with a wildlife habitat practice. The 2012 drought led to some of these practices being dropped from contracts due to the infeasibility of establishing wildlife cover without adequate rainfall. (Note: if the practice was simply delayed until 2013 or later, it would count as a contract modification but not as a dropped practice.) This example meets the first condition of adaptive management, an unexpected change in external conditions. It seems likely, however, that this shock had a bigger impact on the public benefits of the practice, which depend on successfully establishing the cover, and had a limited impact on the unrevealed private incentives. The critical question, which often is not easily answered in the contract data, is why dropping the practice produced higher private and public net benefits—and presumably met the program rules—rather than other options of delaying the practice or replacing it with an alternative practice that could be implemented during the drought. For these reasons, we cannot simply infer from the drought conditions that the dropping of the wildlife practice was definitively adaptive management. The best we can say is that it represents a possible case of adaptive management.

In contrast to adaptive management, producers could seek approval to drop a practice from a contract in order to increase the private net benefits of the contract. Since contracts are voluntary,

³ ERS analysis of ProTracts data and discussion with NRCS irrigation experts. Data on the increase in steel prices available at <https://fred.stlouisfed.org/series/PCU331210331210>. Sample NRCS cost comparison on PVC pipe and steel pipe available at https://efotg.sc.egov.usda.gov/references/public/NJ/CostSenarios_430-IrrigationPipeline.pdf.

we assume that all contracts contain at least one practice for which the producer’s private, on-farm net benefits are positive – after accounting for both the financial assistance and the producer’s own out-of-pocket or in-kind expenses. Note that private net benefits likely include a combination of a profit motive, reflecting the fact that farms and ranches are businesses, and a stewardship ethic (Thompson, Reimer, and Prokopy, 2015). However, contracts may also include at least one practice for which the producer’s private, on-farm net benefits are negative. This could occur if an EQIP initiative required such a practice or if a producer included the practice in order to increase the ranking of the application. If the producer is able to drop such a practice, then it will increase the overall private net benefit for the contract as a whole, but will reduce total program benefits. Even if the program is able to reobligate the unused financial assistance dollars to a new contract with a different producer, it would typically involve the planning and administrative costs required to develop the new contract and a loss of some of the conservation planning and administrative effort that went into the original contract.

An example of dropped practices due to such unrevealed incentives can look similar to the irrigation pipe example above. However, perhaps the post-contract change in costs arises not because of a change in market conditions but because the producer underestimated the actual costs when signing up. As the stylized example in table 2 shows, this results in the possibility of negative net private benefits for the contract. The difference between unrevealed incentives and adaptive management in this case is very much about the source of the change in costs. As we will discuss later, there may also be reasons that a practice gets included on contracts even when the private net benefits are expected to be negative given all of the (unrevealed) incentives available to the producer at the point of signing the contract.

Table 2.
Stylized example of adaptive management due to an increase in costs.

Private benefits with financial assistance			Post-contract change			
Cost type	Cost	Benefit	Payment **	Net benefit	Change in costs	New net benefit
High	\$50	\$32	\$20	\$2	\$5	(\$3)
Average	\$40	\$27	\$20	\$7	\$5	\$2
Low	\$30	\$25	\$20	\$15	\$5	\$10

EQIP=Environmental Quality Incentives Program.

*Costs may be partially revealed when practice implementation results in receipts for materials.

**Payments rates are typically 50 percent of average costs. The benefits are assumed to be unobserved, which makes the benefits unrevealed incentives.

Source: USDA, Economic Research Service calculations based on Natural Resources Conservation Service ProTracts data.

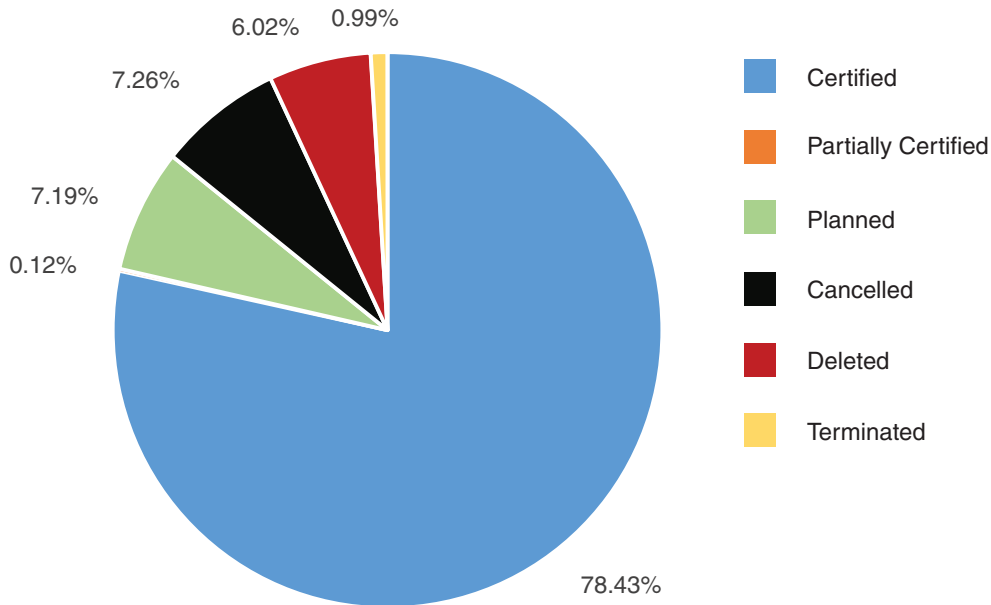
Summary of Data on Contract Status and Practice Status

The population for this study is all contracts signed during fiscal year 2010 that were either still active or were completed at the end of the 2010 fiscal year. From the original 36,499 contracts for 2010, 79 percent had been completed by the spring of 2014. Another 11 percent of contracts (3,929) were still listed as active in 2014. About 9 percent of contracts (3,347) had been cancelled, and 1 percent had been terminated. (Additional discussion in appendix table A1.)

For the original 168,195 practices on 2010 contracts, about 78 percent had been certified by the spring of 2014. A very small share (0.1 percent) was partially certified, and about 7 percent were still listed as planned. This leaves just over 14 percent of the original practices dropped from the contracts through a deletion, cancellation, or termination (fig. 3).

Figure 3

Status of practices on fiscal year 2010 EQIP contracts as of spring 2014



EQIP= Environmental Quality Incentives Program.

Source: USDA, Economic Research Service calculation from ProTracts data. When contracts are initially signed, all practices have a status of “planned.” As practices are completed and reviewed by Natural Resources Conservation Service (NRCS), the practice status is changed to “certified.” Other practice status codes are described in more detail in the report and in NRCS handbooks.

Cancellation and termination are contract-level decisions, so all of the cancelled practices are on cancelled contracts and all of the terminated practices are on terminated contracts. Since contract cancellation and termination often occur part-way through implementation, there are many situations where some practices are completed (certified) or deleted, or where new practices have been added onto these contracts before they were terminated or completed. Despite this possibility, almost all of the deleted practices are on either completed or active contracts, with 70 percent of them on completed contracts (table 3).

Table 3.

Relationship between EQIP contract status and practice status

Contract status in 2014				
Practice status in 2014	Active	Completed	Cancelled	Terminated
Certified	23,848	104,707	2,963	395
Partially certified	165	8	20	2
Planned	12,088			
Deleted	2,687	7,019	359	58
Cancelled			12,214	
Terminated				1,661

Note: This analysis only includes conservation practices that were originally on fiscal year 2010 contracts for EQIP (Environmental Quality Incentives Program).

Source: USDA, Economic Research Service analysis of Natural Resources Conservation Service ProTracts data.

Certified Practices Common, New Practices Rare, on Modified Contracts

The frequency of dropped practices on contracts in which there are not also completed and certified practices illustrates cases where adaptive management is most plausible. If a contract with no completed and certified practices is cancelled or terminated, there is little reason to believe that there are significant differences between the net private benefits for the practices on a contract. In contrast, if there are certified practices on contracts with dropped (deleted, cancelled, or terminated) practices, this at least suggests the possibility that the completed practices had higher private net benefits than the dropped practices.

New practices on a contract are another key sign of adaptive management. If dropped practices appear on contracts with new (added) practices, there is reason to consider that these dropped practices are more likely to be adaptive management.

There are distinct differences across the three types of dropped practices in the types of contracts on which they appear. Very few deleted practices (about 0.1 percent of all practices) are on contracts that have no certified practice (table 4). In contrast, cancelled and terminated practices are most likely to be on contracts that have no certified practices and are 100 percent dropped. This result is not entirely surprising since it is likely that a 2010 contract with no certified practices by 2014 would have either been terminated by NRCS or cancelled at the request of the farmer.

Table 4.

EQIP practice status varies across contracts with new, no new, or-not-at-all certified practices

Practice status	Contract has new practices	Contract has no new practices	100% of contract dropped
Deleted	1.9	4.0	0.1
Cancelled	0.3	2.1	4.9
Terminated	0.0	0.3	0.6
Certified	10.7	67.7	0.0
Partially certified	0.0	0.1	0.0
Planned	1.7	5.2	0.4

NRCS=Natural Resources Conservation Service.

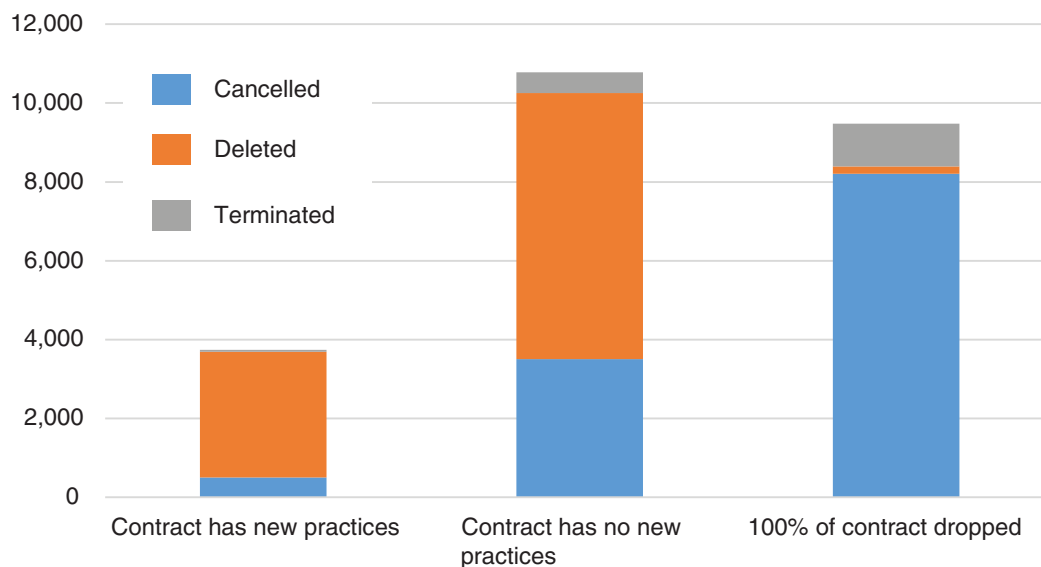
Note: percentages only include practices that were originally on fiscal year 2010 EQIP (Environmental Quality Incentives Program) contracts. Designation of contracts as having a certified practice is based on all practices, original and new. Designation of new practices is based on contracts having practices that appear in ProTracts in 2014 but that did not appear in 2010.

Source: USDA, Economic Research Service analysis of NRCS ProTracts data.

Some “new” practices were added to contracts after 2010. Given the way obligations constrain the total financial assistance on a contract, this would typically only occur if at least one other practice is dropped. Among those contracts with at least one new practice, there is a large difference in the types of contracts that have deleted practices versus cancelled and terminated practices. There were 7,273 new practices by 2014, on 3,178 unique contracts. The practice status most associated with new practices is “deleted,” not surprising given that we would expect many deleted practices to be replaced with alternative practices. However, two-thirds of deleted practices are on contracts without any new practices (fig. 4). Cancelled and terminated practices are very rarely associated with contracts that have new practices, which is not surprising given that cancellation and termination of practices occur in response to cancellation or termination of contracts.

Figure 4

Most dropped EQIP practices are not replaced with new practices



EQIP= Environmental Quality Incentives Program.

Source: USDA, Economic Research Service calculation from fiscal year 2010 EQIP contracts in the Natural Resources Conservation Service (NRCS) ProTracts data with practice status as of spring 2014. Counts of dropped practices are coded by the practice status. Practices can be individually “deleted” from a contract with approval from NRCS. When NRCS approves a participant request to cancel a contract, all remaining practices that have not yet been certified are “cancelled.” When NRCS field staff decide to terminate a contract, all remaining practices that have not yet been certified are “terminated.” Counts of dropped practices are grouped according to three types of contracts: those that have had new practices added (and have not had 100 percent of practices dropped), those that have not had any new practices added (and have not had 100 percent of practices dropped), and those for which all practices on the contract were dropped.

Reasons Stated for Modifications Provide Evidence of Adaptive Management for Some Practices

Modifications are recorded primarily at the contract level and can include relatively minor changes to contracts, such as adjustments to the planned year or to the estimated acres for a practice. Of the 2010 contracts, 35 percent have no modifications. About 52 percent of contracts with any modification reasons recorded have only one modification. Less than 3 percent of modified contracts have 6 or more modifications, with a maximum of 16 modifications. While multiple stated modifications per contract can make association with dropped practices difficult, in most cases there is a direct link between the change in practice status and the modification reason. There are 21 possible stated reasons for modifications. The most common four reasons constitute about 76 percent of the total modifications (table 5).

The most frequently stated reasons for modifications do not provide strong evidence of adaptive management. Almost half of the modifications are categorized as “add, edit, or delete practices or components,” which provides little information on the reason and combines deletion of practices with other changes. The next most common reason is “cancellation—other economic or personal hardship,” which suggests adaptation to changing conditions faced by the farmer. However, this category leaves considerable ambiguity as to the motivation for these modifications. For example, an income shock that makes it difficult for a producer to cover his portion of the practice cost is a permissible reason for a contract modification that would qualify as adaptive management.

However, whether a farmer who experiences such an income shock actually requests a cancellation depends upon the unrevealed incentives of any practices that remain uncompleted at the time of the income shock. A farmer with lower expected net benefits prior to the income shock would be more likely to have negative net benefits due to the shock and therefore more likely to request approval to delete the practice or cancel the contract (similar to the example of the cost shock in table 2). The prevalence and ambiguity of income shocks as a cancellation reason is, therefore, a motivation for investigating unrevealed incentives in the subsequent chapters of this report.

There are several stated reasons that provide stronger evidence than income shock of adaptive management as a response to changes outside the control of the farmer. The two most notable examples are “cancellation—natural disaster” and “cancellation—major illness,” which, respectively, account for only 3.2 percent and 1.1 percent of modifications on contracts with dropped practices.

Based on program rules, contract violations are expected to lead to contract terminations, and this is evident in the reported modification reasons. About 1.6 percent of modifications are due to stated contract violations. Other reasons for terminations, which are not frequent enough to appear in this table, are changes in eligibility and loss of land control.

Table 5.

Top-stated modification reasons on EQIP contracts with dropped practices

Number of modifications	Percent	Descriptions	ID-type code
8,826	47.6	Add, edit, or delete practices or components	3
2,251	12.2	Cancellation other economic or personal hardship	13-9
1,697	9.2	Contract length	4
1,331	7.2	Payment—installation measurement exceeds plan amount	0-15
742	4.0	Other	12
594	3.2	Cancellation—natural disaster	13-1
474	2.6	Acreage or land unit	1
369	2.0	Schedule completed	17
301	1.6	Practice design or specification changes	9
293	1.6	Termination—contract violation	14-12
209	1.1	Cancellation—major illness	13-3
162	0.9	Cost share method or cap	5
158	0.9	Cancellation—environmental or archeological concerns	13-8
148	0.8	Practice substitution or reapplication	10
147	0.8	Payment—change in practice extent	0-18

EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service summary of Natural Resources Conservation Service ProTracts data.

Frequency counts are for all modification reasons listed in spring 2014 on fiscal year 2010 EQIP contracts with at least one dropped (cancelled, deleted, or terminated) practice. Contracts with multiple modifications will be counted multiple times.

Ultimately, the stated reasons for modifications mostly reinforce the information described by the practice status. More than 60 percent of the modifications on contracts with at least one deleted practice have a stated reason of “add, edit, or deleted practice of components.” Similarly, more than 60 percent of the modifications on contracts with at least one cancelled practice have a stated reason of “cancelled.” Contracts with terminated practices have a majority of modifications with stated reasons as “termination.”

All of this information on dropped practices and modification reasons suggests that adaptive management is a potential source of contract modifications. However, the most common types of contract modifications and modification reasons are not sufficient to rule out a substantial role for unrevealed incentives. Both deleted practices and cancelled contracts are commonly associated with certified practices, suggesting that producers on these contracts are getting some of the private benefits from the partial execution of their conservation contracts. Further analysis is needed to examine whether these hardships are associated with some practices more than others or with some contracts more than others.

Indirect Evidence Suggests Unrevealed Incentives Lead to Dropped Practices

In this chapter, we examine indirect evidence that unrevealed incentives influence the decision to drop practices. The analysis uses three different approaches to illustrate that the rate at which different practices are dropped potentially provides program managers with important indirect information about the underlying unrevealed incentives.

First, we look across different types of practices and use knowledge from other studies to compare more nearly pure public goods with more nearly pure private goods. This knowledge comes from surveys that allow researchers to compare program participants and nonparticipants using statistical methods. We compare rates of dropped practices to prior research that has statistically estimated the likelihood that the program participants would have adopted these practices without financial assistance, which is inherently an estimate of private on-farm benefits. We also look at differences in rates at which practices are dropped across categories of practices based on fairly broad assumptions about the differences in private on-farm benefits.

Second, we look at the timing of when practices occur on a contract, which we take to be determined by how much private benefit they have for producers, because producers are likely to adopt the practices with highest private benefit first. Differences in practice timing can be related to resource concerns and the natural staging of practices. Thus, this analysis simply illustrates a potentially important interaction between unrevealed incentives and practice timing.

Third, we look at variation in the cost-share, measured as the unit cost within a practice. Variation in unit cost arises from several aspects of program design.

While most Federal incentive programs face challenges related to unrevealed incentives, in one respect EQIP is very different. For example, programs that provide rebates for energy-efficient appliances or laws that give tax deductions for certain types of capital investment usually focus only on single decisions. In contrast, EQIP contracts often bundle together several different practices that can have widely different levels of underlying private benefits for producers. As noted earlier, about 75 percent of contracts in 2010 had two or more practices. These practices are likely to have different private net benefits to producers, which could lead to differences in the likelihood that different practices are completed. This means that the unrevealed incentives operate not only across producers but also across practices within contracts.

Practices With Higher Estimated Private Benefits Are Dropped Less Often

In general, conservation practices with low private, on-farm net benefits are unlikely to be adopted without some sort of financial assistance. These practices are said to have high “additionality,” meaning that almost all adoption of the practices is viewed as having been motivated by the payments. In contrast, conservation practices with higher private net benefits are more likely to be adopted without financial assistance. These practices are said to have low additionality, which means that a significant share of the payments for these practices is viewed as having gone to participants who would have adopted the practices even without the payments. A major challenge in designing any incentive program—from Government conservation programs to private-company coupon programs—is that private benefits are unrevealed incentives from the perspective of the

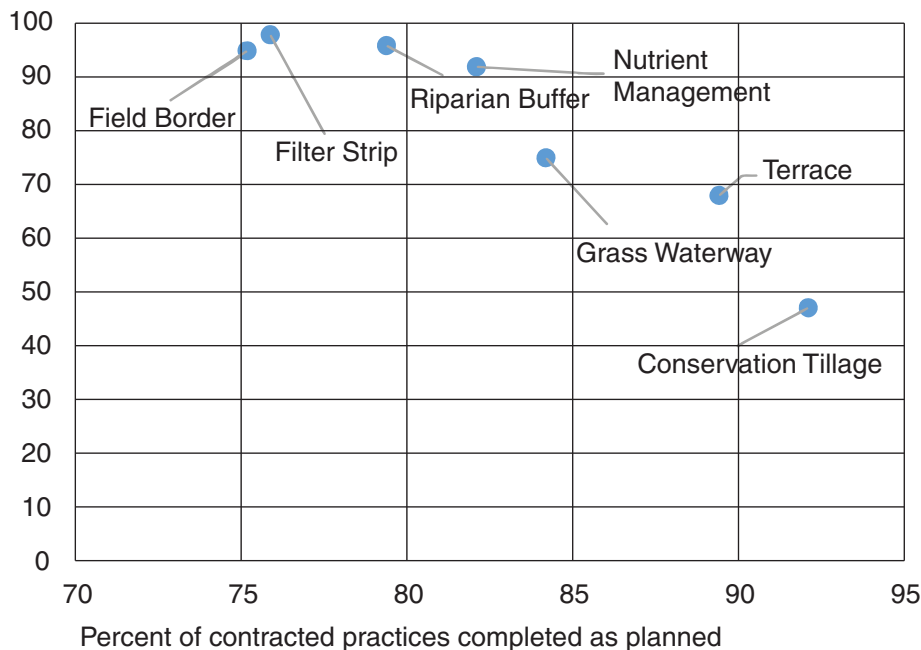
program manager. This makes it very difficult to even estimate the extent of additionality and nonadditionality without a combination of appropriate data and statistical models.

Looking primarily at EQIP-participation, we estimate the additionality for seven types of practices: nutrient management, riparian buffers, field borders, filter strips, terraces, grass waterways, and conservation tillage (no-till or reduced tillage). The first four categories have relatively high additionality, with fewer than 10 percent of practices that received payments likely to have been adopted without those payments (fig. 5). Conservation tillage, which can have significant production benefits and is widely adopted among producers not participating in the program, has a much lower estimate of additionality, with more than 50 percent of practices that received payments likely to have been adopted without those payments. Based on these estimates, we would infer that conservation tillage has greater average private net benefits than the other practices. Grass waterways and terraces fall in between these two groups in terms of additionality.

Using the practice-level contract completion rates from the data for this study, we can compare these additionality estimates—the share of contracted practices that it is estimated would not have been adopted without payments—to the rates at which these practices are completed as planned. This comparison shows that practices with higher additionality (and presumably lower private net benefits) are also more likely to be dropped, and vice versa. For example, conservation tillage has much lower additionality (and presumably higher private, on-farm benefits) and is also less likely to be dropped. In contrast, field borders and filter strips have much higher additionality (and presumably lower private, on-farm benefits) and are more likely to be dropped (fig. 5). This result supports the idea that producers have unrevealed incentives that vary across types of practices.

Figure 5
Comparing dropped EQIP practices to additionality estimates.

Additionality (estimated percent of participants who adopted because of payments)



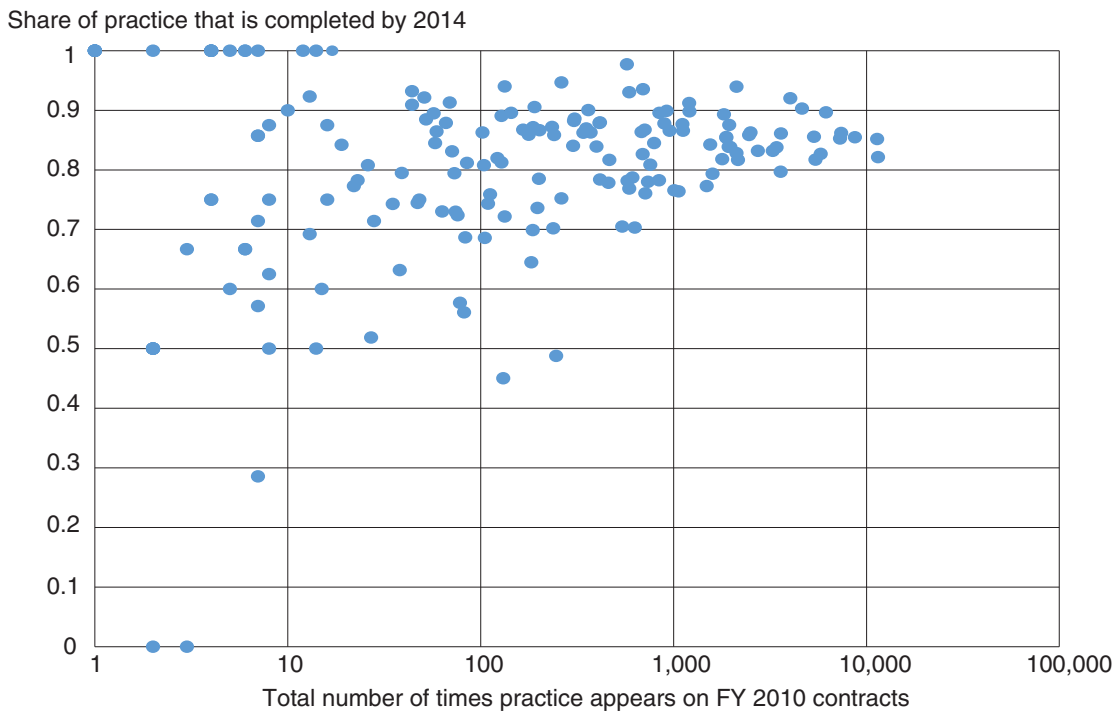
EQIP= Environmental Quality Incentives Program.

Source: The data on percentage of practices completed as planned is from USDA, Economic Research Service analysis of USDA, Natural Resources Conservation Service (NRCS) ProTracts data on EQIP conservation contracts originally signed in fiscal year 2010 and analyzed for practice status in the spring of 2014.

Additionality estimates are not available for all of the practices within EQIP, but program participants provide another way of revealing the extent to which practices have larger private benefits when financial assistance payments are included. Many of the practices that have low rates of completion (high dropped rates) also occur on relatively few contracts (fig. 6). This is expected; since EQIP is a voluntary program, the number of times a practice appears nationally is partially a reflection of how willing producers are to adopt the practices. Practices with higher private, on-farm benefits are likely to appear more often. Looking at the data, we see a strong negative relationship between the popularity of practices and the rate at which the practice is dropped. More popular practices are much less likely to be dropped. An alternative way of framing these results would be to look at the share of practices that are not dropped, which would be a practice-specific version of NRCS’s CIR (Conservation Implementation Ratio, the rate of being successfully implemented). Practices with a higher CIR would also tend to be those that are more popular. While unrevealed incentives are one explanation for this relationship, another possibility is that practices that are both more common and more likely to be implemented as planned are those practices for which NRCS field staff are most familiar and able to provide the best design and implementation support. Practice frequency is an imperfect proxy for private benefits since it also reflects the distribution of resource concerns and NRCS priorities for the program. However, the combined information from the frequency with which participants include practices on contracts and the likelihood that these practices are completed as planned can give program managers insight into the extent to which participants have sufficient on-farm private net benefits to encourage practice adoption.

Figure 6

EQIP practices that are more popular are also more likely to be completed



EQIP= Environmental Quality Incentives Program.

Source: USDA, Economic Research Service Calculations based on fiscal year 2010 EQIP contracts in the NRCS ProTracts database. Observations are practices aggregated by Natural Resources Conservation Service (NRCS) practice code.

To provide some additional insight into whether these patterns might reflect the extent of private versus public benefits of different practices, we look at the most frequently and least frequently dropped practices. We limit this summary to practices that occurred at least 20 times in fiscal year 2010. (Many practices that have high public benefits but relatively low private, on-farm benefits—such as wetland and wildlife practices—occurred fewer than 20 times.)

On average, across all contracts, about 14 percent of all practices are dropped. However, there is a great deal of variation across types of practices. Some practices are dropped at rates two to four times the average (28 to 55 percent, table 6). A variety of these practices are clearly examples with limited private benefits. For example, practices such as drainage-water management or sediment basins, which capture sediment after it has left the field but before it enters a waterway, are likely to have much more limited private benefits and proportionately greater off-farm public benefits.

In contrast, some practices with good off-farm benefits could have considerable private, on-farm benefits. Examples include seasonal residue management, livestock-cooling ponds, irrigation pipelines, and organic transition plans. Reasons for the high dropped rates may be somewhat idiosyncratic. For example, written plans require a farmer to find a certified technical service provider (TSP) to complete the plan, and in 2010 few TSPs were certified for writing plans involving organic agriculture. In another example, steel irrigation water pipes, which can have high private benefits, have a very high rate of being dropped, which may have been due to a significant increase in the price of steel during this period. Notably, other types of irrigation conveyance pipes did not have such a high drop rate.

Table 6.

Most frequently dropped EQIP practices

Code	Name	Total	Deleted	Cancelled	Terminated	Dropped
138	Conservation plan supporting transition written	131	0.0%	50.4%	4.6%	55.0%
344	Residue management seasonal	246	47.2%	3.3%	0.8%	51.2%
423	Hillside ditch	27	3.7%	40.7%	3.7%	48.1%
554	Drainage water management	82	34.1%	9.8%	0.0%	43.9%
430ff	Irrigation water conveyance, pipeline, steel	78	29.5%	12.8%	0.0%	42.3%
557	Row arrangements	38	0.0%	23.7%	13.2%	36.8%
799	Monitoring and evaluation	183	24.6%	10.9%	0.0%	35.5%
330	Contour farming	105	6.7%	22.9%	1.9%	31.4%
350	Sediment basin	83	14.5%	15.7%	1.2%	31.3%
422	Hedgerow planting	186	14.5%	15.1%	0.5%	30.1%
122	Agricultural energy management plan headquarters written	238	0.0%	28.6%	1.3%	29.8%
362	Diversion	630	18.6%	10.0%	1.1%	29.7%
574	Spring developement	542	19.9%	8.9%	0.7%	29.5%
521a	Pond sealing or lining flexible membrane	28	25.0%	0.0%	3.6%	28.6%
635	Vegetable treatment area	133	21.8%	6.0%	0.0%	27.8%

EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service calculations from Natural Resources Conservation Service ProTracts database. Only practices with at least 20 occurrences on 2010 contracts are included. "Total" gives the number of practices that appear on the original 2010 contracts. Deleted practices are removed from a contract at the request of the participant and require NRCS approval. Cancelled practices occur when NRCS approves cancellation of all remaining practices on a contract, again at the request of the participant. Terminated practices occur when NRCS makes a decision to terminate all remaining practices on a contract.

In contrast, the practices that are dropped least frequently are much clearer examples of practices with higher private benefits (table 7). Examples of practices that have presumably large private benefits for the producers include irrigation-land leveling, land clearing, and irrigation sprinklers. Some of these practices also provide large public goods but are likely of high private benefit to the farmer because of regulations that require or encourage their installation. Examples include animal mortality facilities and engine replacements; the latter may often be related to air quality regulations.

Table 7.

Least frequently dropped EQIP practices

Code	Name	Total	Deleted	Cancelled	Terminated	Dropped
723	Engine replacement	573	0.0%	2.1%	0.2%	2.3%
460	Land clearing	262	0.0%	4.2%	1.1%	5.3%
428a	Irrigation water conveyance, ditch and canal lining, plain concrete	133	4.5%	1.5%	0.0%	6.0%
442	Sprinkler system	2,122	2.2%	3.3%	0.5%	6.0%
464	Irrigation land leveling	694	2.9%	3.5%	0.1%	6.5%
585	Stripcropping	44	0.0%	6.8%	0.0%	6.8%
345	Residue and tillage management reduced till	588	2.0%	4.6%	0.3%	7.0%
716	Renewable energy system	13	7.7%	0.0%	0.0%	7.7%
436	Irrigation reservoir	51	2.0%	5.9%	0.0%	7.8%
329	Residue and tillage management no till	4,032	2.8%	4.8%	0.4%	8.0%
601	Vegetative barrier	69	1.4%	7.2%	0.0%	8.7%
106	Forest management plan written	1,205	0.0%	5.6%	3.2%	8.8%
462	Precision land forming	44	6.8%	2.3%	0.0%	9.1%
316	Animal mortality facility	190	1.6%	7.4%	0.5%	9.5%
666	Forest stand improvement	4,633	3.2%	5.0%	1.6%	9.7%

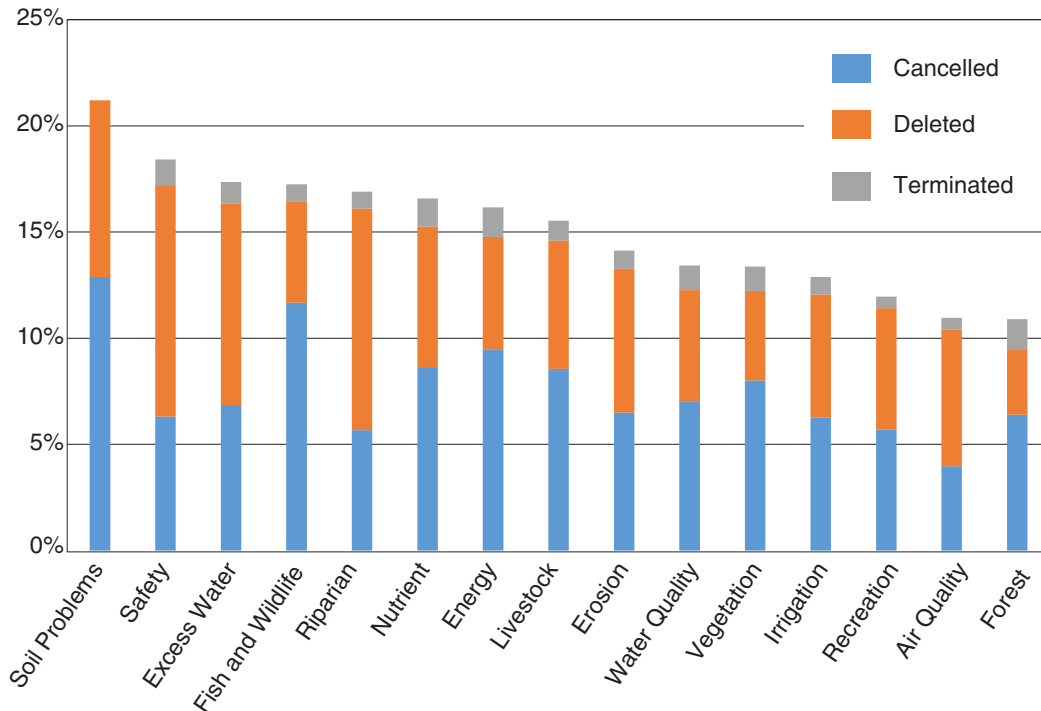
EQIP= Environmental Quality Incentives Program.

Source: USDA, Economic Research Service calculations from Natural Resources Conservation Service (NRCS) ProTracts database. Only practices with at least 20 occurrences on 2010 contracts are included. "Total" gives the number of practices that appear on the original 2010 contracts.

Since this examination of high and low dropped rates was limited to a subset of all EQIP practices, we also aggregated the practice codes into broad categories that reflect the main focus of the practice in terms of resource concerns addressed by each practice. The categories provide a measure of the extent to which conservation practices are impure public goods. To develop those categories, we reviewed the practice standards and assigned each practice to the category that most closely reflected the primary purpose of the practice.⁴ For the most part, these categories closely follow categories that NRCS utilizes in other settings. The categories range in dropped practice rates from over 20 percent to just over 10 percent (fig. 7).

Figure 7

EQIP conservation practice cancellation, deletion, and termination rates by category



EQIP= Environmental Quality Incentives Program.

Source: Aggregation of practices in Natural Resources Conservation Service (NRCS) ProTracts based on categories defined by USDA, Economic Research Service. (See appendix table A4 for a complete list of practices by category.)

⁴ An alternative approach would have been to develop categories based on NRCS resource concerns and the conservation practice physical effects (CPPE) scores. A test of that approach revealed that such categories would not uniquely categorize practices since many practices rank high (a 4 or 5 on a -5 to 5 scale) on multiple resource concerns, while other practices many not rank that high on any resource concerns. Similarly, the categories of practices listed on NRCS annual reporting in the RCA viewer are neither unique nor comprehensive. Those categories are designed to provide an overview of broad categories, taking into account the fact that many practices may address multiple national concerns such as soil health and water quality. For that reason, many specialized practices do not appear in those tables, while other practices appear in multiple tables.

The two most frequently dropped categories are “soil problems” and “safety.” Both involve a very small number of total practices, so the high rate of dropped practices may reflect the low popularity of these practices rather than the extent to which these practices are closer to pure public goods. We would expect both of these practice categories to have on-farm private benefits in addition to public benefits, but it is possible that the low popularity of the practices indicates that the private benefits are small relative to the average cost to the farmer even after the receipt of financial assistance.

The next four most frequently dropped categories are arguably practices that are more focused on producing off-farm public benefits and, in most cases, have more limited on-farm benefits. Fish and wildlife practices are perhaps the most clear-cut case of nearly pure public goods among EQIP practices. Riparian buffer, habitat, and nutrient management practices are also focused on producing off-farm water benefits, often related to water quality or wildlife. Of these, nutrient management is unique in that it tends to combine both higher potential off-farm public benefits and on-farm private benefits, although the net on-farm benefits are uncertain since adoption of nutrient management primarily impacts the timing of fertilizer application and does not have a statistically significant impact on the fertilizer application rate (Claassen et al. 2014).

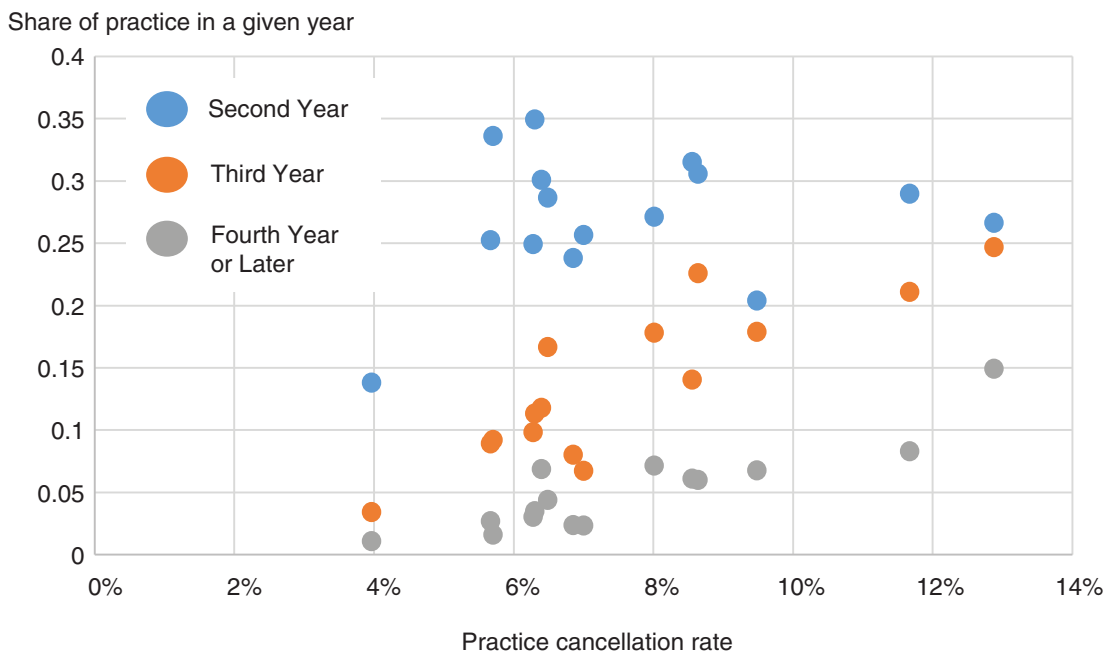
In contrast, two other categories that would seem to stand out as providing more pure public goods—water quality and air quality—have lower cancellation rates. Air-quality-related practices (which produce mostly off-farm, public benefits) may have lower dropped rates because regulation often mandates their installation. For example, EQIP includes practices under the National Air Quality Initiative to help producers comply with requirements under Clean Air Act regulations.⁵ The key finding highlighted by looking at these categories is that in some situations a key form of on-farm private benefits is compliance with regulations, so even though the resource concern addressed by the practice is focused on off-farm benefits, the institutional context changes the underlying incentives.

Irrigation practices have relatively large on-farm benefits and a very low rate of dropped practices. Other categories dominated by practices with considerable on-farm benefits—such as erosion control (which also has large off-farm water quality benefits), vegetation, and livestock practices—also tend to have lower rates of dropped practices.

⁵ <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/newsroom/releases/?cid=nrcseprd1178606>

Figure 8

EQIP practice cancellation versus year on contract by category



EQIP= Environmental Quality Incentives Program.

Source: Calculations by USDA, Economic Research Service on fiscal year 2010 EQIP contracts in Natural Resources Conservation Service (NRCS) ProTracts as of spring 2014. Practices are categorized into broad categories (e.g., water quality) and separated into the year in which they appear. For practices that are in the third or fourth year of a contract, those more likely to appear in later years are also more likely to be cancelled. This relationship is not strong for practices in the second year of a contract.

Practices Appearing Later on a Contract Are Dropped More Often

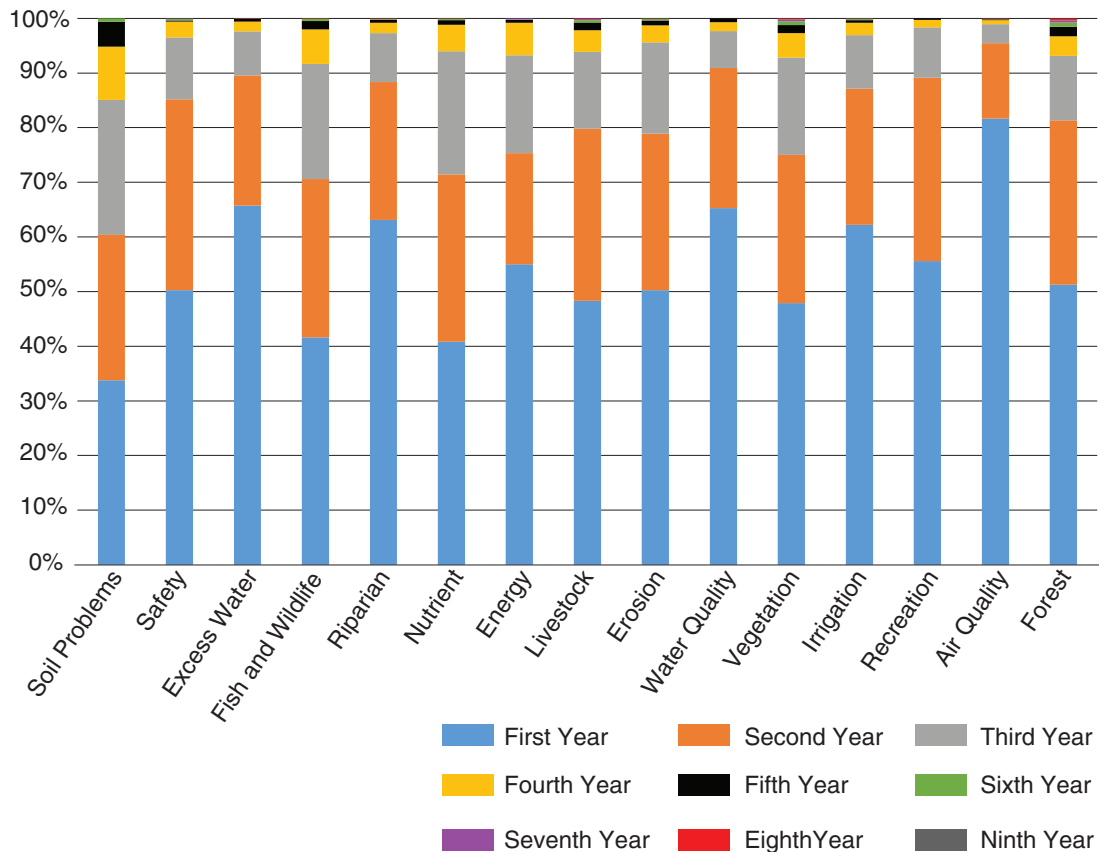
A review of the broad categories discussed above reveals that practices that more commonly occur in later years of a contract are more likely to have higher cancellation rates (fig. 8). This is most pronounced for practices in the third, fourth, and later years; the relationship is less robust for the share of practices in the second year. The positive correlation is similar for termination rates but is not observed for deletions, perhaps because deletions are more likely to be adaptive management.

This relationship between practice timing and cancellation rates likely reflects a mixture of both unrevealed incentives and adaptive management. Practices that occur later on a contract would have more time to be impacted by weather, farm-income, or other shocks that influence the net benefits—either private or public—of completing the practice.

Unrevealed incentives may have an influence on the initial practice timing. During application for the program, sequencing of practices is often related to the details of the conservation plan, but producers also have some say in how to arrange the practices on their contract. When a contract spans multiple years, producers have an incentive to put their highest net benefit practices in the first years. Practices that have large private net benefits, such as irrigation-efficiency improvements, would therefore be more likely to occur earlier on contracts. The frequency of practices that occur in the second or later years closely tracks the practice cancellation rates of the practice categories.

Soil-problem-related practices and fish and wildlife practices are the most likely to occur in the second year or later (fig. 9). For fish and wildlife practices, this corresponds with the idea that these have lower private, on-farm benefits. Some soil-related practices, particularly conservation tillage, may also tend to appear in later years because they are often included as 3-year management practices. Air quality practices, which had the lowest cancellation rate, are the least likely to begin in the second year or later. As noted, since air quality practices are often tied to regulatory compliance, from the farmer’s perspective they have high private benefits if the penalties for noncompliance are large enough to make installing them (even in the absence of EQIP financial assistance) more profitable—or less unprofitable—than not installing them.

Figure 9
Share of all EQIP practices by planned year on contract



EQIP= Environmental Quality Incentives Program.
 Source: USDA, Economic Research Service calculations from Natural Resources Conservation Service (NRCS) ProTracts using practice categories developed by ERS and listed in the appendix.

Variation in Financial Assistance Levels Could Influence Dropped Practices

If producers' unrevealed incentives are an important driver of practices being dropped, as the findings suggest, then higher levels of financial assistance should reduce the share of practices that are dropped. As discussed in the introduction and presented in tables 1 and 2, the financial assistance level interacts with unrevealed private incentives and unexpected shocks to those incentives to impact the final net benefits for each practice on a contract.

Since practices are not of uniform size across farms, variation in financial assistance comes through differences in the unit cost associated with each practice. For practices that are counted by acres, this is a dollars-per-acre variable. Other practices may be counted by linear or cubic feet or simply a discrete number of units.

There are two basic steps in the way NRCS calculates the level of financial assistance (per unit) for a given practice, although there have been variations in how this process has functioned over time. First, NRCS economists calculate the expected cost for implementing a practice in each State and assign a unit cost for that practice. Second, for a given initiative within a given State, NRCS sets a level at which the financial assistance will cover the unit cost. This is commonly 50 percent of the total unit cost, but, subject to the upper limits specified in the Farm Act, it can be higher or lower. It is also often higher for beginning and limited-resource producers.

While unit costs vary geographically, States with higher unit costs (levels of financial assistance) for a given practice do not necessarily provide participants with higher net benefits for that practice. Differences across States are likely to reflect actual variation in costs of implementing the practices, such as when the underlying labor and equipment costs are higher in one State than another. Due to this variation, we cannot use differences in unit costs across States to easily test how much a change in unit costs would impact dropped practices.

A similar challenge arises in looking at variation in unit costs due to the provisions in EQIP that allow for higher levels of assistance for historically underserved (beginning, socially disadvantaged, and limited-resource) farmers and ranchers. While these participants may receive a higher level of financial assistance for a given practice, they may also have an underlying difference in likelihood of completing practices due to differences in debt-to-asset ratios, land quality, or farming experience.

Contract Structure Influences Dropped Practices

Most prior research on EQIP and other NRCS programs has focused on two aspects of program design: unit costs and the ranking tool. In this section, we focus on a third aspect of program design: contract structure. Broadly defined, contract structure is the size and complexity of contracts. We estimate the impact that changes in contract structure have on the probability that a contract with a certified practice also has a dropped practice.

For the following analysis, there are two important differences—compared to analysis in the prior sections—in how we use the ProTracts data. We shift to a contract-level analysis and look at the probability that a contract contains at least one dropped practice. One of the key motivations for studying contract structure is the potential that the interaction of unrevealed incentives and the program design, particularly contract ranking, results in strategic behavior. In most contract settings, strategic behavior occurs when one party to the contract uses private information about the party's benefits and costs in negotiating the contract, taking into account the expectations of other actors, either the other party to the contract or potential competitors for the contract. Almost all contract settings have the potential for strategic behavior. In the context of EQIP, strategic behavior is to some extent a desired result of contract ranking, in that the competitive pressure of ranking could encourage participants to include practices that have higher public benefits and, perhaps, lower private benefits. However, strategic behavior can be detrimental to the program if participants are including practices with negative net private benefits to increase their ranking, while hoping to drop or modify those practices in the future. The challenge for program design and management is that strategic behavior is difficult to observe, which is why NRCS has very stringent guidelines on the approval of practice modifications. For this analysis, we restrict our focus to contracts with more than one practice and with at least one certified practice, since strategic behavior is less likely if a contract does not produce at least some private benefit through at least one completed practice.

Contract structure results from the interaction of the practices allowed under a given EQIP initiative, the resource concerns on the particular land, the mixture of practices needed to address those resource concerns, and the extent to which the participant is willing to include each of those practices on a contract. The presence of unrevealed incentives raises concerns that contract structure might be at least partially influenced by strategic behavior. Given that the large majority of practices are completed as planned, strategic behavior is likely rare within the program overall. However, this type of strategic behavior could still be a significant driver of dropped practices. Evidence from the contract level analysis is likely to suggest both positive and negative effects in the likelihood that practices are dropped. For example, if a farmer bundles together practices with high private benefits with other practices that have low private benefits in order to increase the ranking of an offer, that contract structure will have a higher number of practices. We expect, then that such contracts—those with a larger number of practices—will be associated with a higher probability of dropping the lower private benefit practices and a lower probability of dropping the higher benefit practices.

Consider a hypothetical example of a program with three practices that vary by net private benefits, including financial assistance, to the producer (assuming all practices are on the conservation plan and are funded under the given initiative), and consider the impact of practices on the ranking of the offer, assuming that the scores are additive (more practices unambiguously increases the score) and that higher scores make an offer more likely to be accepted.

- Practice A: high positive net private benefits, low-ranking score
- Practice B: low positive net private benefits, middle-ranking score
- Practice C: negative net private benefits, high-ranking score

In this program, producers would be willing to enroll in a contract with A or B, but they would not voluntarily enroll in a contract with just practice C. However, we might see contracts with two or three practices in which C has been added in order to increase the ranking. (In the actual program, this could only occur if there is a practice like C that is applicable to a resource concern that has been identified during the conservation planning process. Given the wide variety of resource concerns and practices, it is reasonable to assume that a large portion of producers face such a case.) This gives five basic contract types: two small contracts consisting of only A or B, and three larger contracts consisting of A and C, B and C, or A and B and C. Practice C has negative net benefits and is more likely to be dropped, and so the larger contracts are associated with the higher drop rate for C. But these larger contracts are also associated with the lower drop rates for A relative to B. More generally, under strategic behavior, practices with high private net benefits are less likely to be dropped, practices with low private net benefits are more likely to be dropped, and more complex contracts are likely to include both types of practices.

The mix of positive and negative correlations between contract structure and practice drop rates could lead us to mistakenly find that contract structure has no effect. To address this problem, we estimate a model of the probability that a given contract has at least one dropped practice conditional on contract structure.

As noted above, we restrict our primary model to contracts that have at least two practices, with at least one certified, to examine whether restrictions on contract structure would be a policy-design response to strategic behavior. We exclude contracts with only a single practice because there is no potential for strategic behavior in those contracts. If producers have only one practice and drop that practice—which is a cancellation of the contract—then they will not receive any private benefit from their application. Contracts with single practices only represent about 4 percent of dropped practices, although they do represent about 27 percent of all contracts (table 8). More importantly, for single-practice contracts, restrictions on contract structure as a policy design would not be a meaningful change in program design.

We also exclude contracts that have multiple practices but no certified practices, which are relatively rare. These contracts could have involved strategic behavior in the beginning, insofar as producers could have included one practice with high private benefits that they intended to complete and one practice with low private benefits that they intended to drop. Having not completed any practice, however, the producers have not actually succeeded in getting any private benefit from program participation. Even though less than 5 percent of contracts have multiple practices but none certified, these contracts contain more than 35 percent of dropped practices (table 8). From a program design perspective, understanding what causes entire contracts to get dropped is therefore an important question for future research. We do not attempt to link contract structure to the performance of these contracts.⁶

⁶ A full consideration of any restriction on contract design would ideally include the possibility that it could increase the number of these contracts, especially contract cancellation that occurs when no practices have been completed.

These restrictions are informative regarding the potential for the relative importance of contract structure and strategic behavior. We see that 40 percent of all dropped practices occur on either single-practice contracts or multiple-practice contracts without any certified practices. While this leaves a majority of dropped practices that could potentially be related to strategic behavior, which might be addressed through contract structure, this also shows that a large portion of dropped practices cannot be addressed through changes in contract structure or other efforts to limit strategic behavior.

Table 8
EQIP contracts with and without certified practices

Category based on practices	Share of all contracts	Share of all practices	Share of dropped practices
Single practice on contract	26.8%	5.8%	4.4%
Multiple practices on contract, no certified practices	4.8%	5.4%	35.2%
Multiple practices on contract, at least one certified	68.4%	88.8%	60.4%

EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service categorization of 2010 EQIP contracts in Natural Resources Conservation Service ProTracts data.

Incentives Exist To Strategically Adjust Contract Size and Complexity

The many types and timing options for conservation practices create millions of possible unique EQIP contract structures. To capture contract structure in a concise set of variables, we examine two dimensions of contract structure—size and complexity—using four variables. Using these simplified measures allows us to estimate the impact of contract structure across the program as a whole. More refined definitions of contract structure would likely be needed to focus on outcomes within a specific conservation initiative or when looking at contracts that address a particular type of resource concern.

Two variables capture contract size. Total treated acreage on a contract indicates how much land all of the practices cover, and some acres may have more than one practice. Prior research has shown that the total acres on a farm (not necessarily acres in a contract) influence both the transaction costs faced by a potential program participant and the likelihood of participation in the Conservation Stewardship Program (McCann and Claassen, 2016). Total contract cost captures the total financial assistance on all of the practices on the contract. Since financial assistance is proportional, larger contracts require larger investment of funds and resources on the part of the producers.

Two other variables capture contract complexity. The total number of practices indicates how complicated a contract is. This can be measured either in terms of all practices or in terms of unique practices. The latter avoids double counting by only counting a 3-year management practice in the first year in which it appears. The total number of years indicates how spread out those practices are in time. The longer a contract is, the more complex and potentially costly it is to administer and complete, and the more likely it is to be subject to external shocks over the life of the contract.

The prior analysis showed that there is a strong correlation between the rate at which practices are dropped and indirect measures of the unrevealed incentives. We begin this section by examining

whether the EQIP scoring and ranking rules may provide any incentive to modify contract structure. The presence of such an incentive would be a necessary—but not sufficient—condition for strategic bidding behavior; if we do not find evidence of incentives, we will reject the hypothesis that some participants are making strategic decisions with respect to contract structure. In contrast, if we observe possible incentives related to contract structure, we will conduct further analysis to test for evidence of strategic behavior.

We estimate the impact of our four contract structure measures on the ranking score either as an absolute number or as a relative ranking of a contract, while we control statistically for the differences in ranking across EQIP initiatives. The absolute ranking requires statistical controls (fixed effects) for differences in scores across fund codes. The relative ranking captures variation in competitiveness across fund codes at the same time that it normalizes the score. (For example, a second-from-the-bottom ranked contract in a fund code with four contracts would have a normalized ranking of 0.5 (2/4), whereas a second-from-the-bottom ranked contract in a fund code with 100 contracts would have a normalized ranking of 0.02 (2/100).⁷

We find that three of the four contract structure variables are strongly and consistently associated with an improvement in a contract’s ranking, and the fourth variable (acres) has a positive association for the absolute score and a negative association with the ranking (table 9). There are many reasons that the program offers a higher ranking on larger and more complex contracts. Such contracts are often likely to address more resource concerns or more complex resource concerns. In addition, participants’ opportunities to engage in strategic selection of practices are constrained by the conservation planning process, in which plans and offers are developed in consultation with conservationists. Nonetheless, this finding illustrates that the program design may give producers an incentive to create an application that is larger or more complex in order to improve the likelihood that their application will get accepted by NRCS.

Table 9
Impact of EQIP contract structure on average application score and ranking

Variable	Impact on ranking score	Impact on relative rank
Contract cost	20.43	27.35
Contract acres	7.68	-0.86
Duration (years)	11.3	3.45
Observations	129,630	129,630
Fund codes (groups)	3,375	3,375
r-squared	0.021	0.030
f-test on fixed effects (p-value)	0.000	0.000

EQIP=Environmental Quality Incentives Program.

Notes: The estimates come from a regression of the ranking score or the relative rank on the contract structure variables. The former uses fixed effects to control for average differences in scores across fund codes (initiatives). The latter normalizes scores into ranks with initiatives on a scale of zero to 1. So in an initiative with 100 accepted applications, a value of 0.01 in this column indicates that a marginal change in these variables would increase the relative ranking of an application by 1 place out of 100 accepted offers. Asterisks indicate statistical significance (***) p<1%, ** p <5%, * p<10%). Cost and acres are both logged for the analysis.

Source: USDA, Economic Research Service statistical analysis of Fiscal Year 2010 EQIP contracts in the NRCS ProTracts database.

⁷ Currently, the data do not allow for ranking with ranking periods (batching periods).

Contract Structure Has Mixed Effects on Dropped Practices

In this analysis, we estimate the effect of the contract structure variables on the likelihood of six possible types of contract modifications:

- at least one dropped practice (cancelled, deleted, or terminated)
- at least one terminated practice (i.e., a terminated contract)
- at least one cancelled practice (i.e., a cancelled contract)
- at least one deleted practice
- at least one deleted practice and at least one new practice
- at least one deleted practice and no new practices.

We use an instrumental variables model to adjust for the fact that strategic behavior may influence contract structure. Since our measures of contract structure are highly simplified, we present the findings in terms of the general direction of the effects. The numerical estimates and statistical tests are provided in the appendix.

The association between contract structure and contract outcomes are quite varied, both across aspects of structure and across outcomes (table 10). The most consistent result occurs in the number of practices. On average, contracts with more practices are more likely to have a deleted practice or a cancelled or terminated contract. The other three measures of contract structure all show more mixed results with lower statistical significance. Contract cost and duration are sometimes associated with less-frequently dropped practices. Higher cost contracts are less likely to have deleted practices, and longer duration contracts are less likely to have cancellations or terminations. Larger acreage contracts are more likely to have deleted practices when there is no new practice on the contract and are less likely to have a cancellation or termination.

In terms of strategic behavior, these findings are consistent with the idea that some participants may increase the number of practices on their contracts strategically and are therefore more likely to drop at least one of the practices. The other three measures of contract structure do not appear to be related to strategic dropping of practices, despite possible incentives to do so. The statistical analysis of the results (shown in the appendix) strongly rejects a standard linear regression model (with no instrumental variables), which would be the correct model if the contract structure was not strategically chosen and was “as good as random” when looking across the program as a whole.

Table 10

Estimated impact of EQIP contract structure on likelihood of dropped practices

Variable	Dropped	Terminated	Cancelled	Deleted	Deleted with added practice	Deleted without added practice
Contract cost	-	NS	NS	--	-	-
Contract acres	-	-	-	+	NS	+
Duration (years)	--	--	--	NS	--	NS
Number of practices	++	+	++	++	+	+

EQIP=Environmental Quality Incentives Program.

Notes: : NS is not statistically different from zero. “++” is a positive effect larger than 5 percentage points. “+” is a positive effect between zero and 5 percentage points. “-” is a negative effect larger than negative 5 percentage points. “--” is a negative effect between zero and negative 5 percentage points. Cost and acres are both logged in the analyses.

Source: USDA, Economic Research Service statistical analysis of Fiscal Year 2010 EQIP contracts in the Natural Resources Conservation Service ProTracts database.

Policy Implications and Additional Aspects of Contract Structure

Can program managers, as part of the effort to reduce dropped practices and raise the contract implementation ratio, build on the link between contract structure and contract modifications? Incorporating the findings into a change in program rules or program design would face a number of potential tradeoffs. Here we consider three possible policy responses: a change in the ranking and scoring process, a direct restriction on the number of practices on a contract, and the use of the conservation planning process to indirectly reduce the number of practices on the average contract.

To minimize dropped practices, one policy response could be to change the existing ranking criteria to avoid or reduce the incentive to increase the number of practices on a contract, for example by ranking according to the lowest scoring practice on a contract. As noted earlier, however, since a strategic reaction to the ranking criteria is an important way to get higher public benefit practices on more contracts, any such change might reduce dropped practices but also reduce overall inclusion and completion of those practices across all contracts. This approach would be similar to the earlier changes to the program in the 2002 Farm Act, which prohibited the use of the ranking mechanisms to encourage “no-cost” practices on contracts. Moreover, there may be valid reasons for program managers to encourage more practices on contracts in order to achieve conservation goals, which means that adjusting the ranking mechanisms would require program managers to evaluate the benefit of reducing dropped practices against the cost of constraining their ability to achieve these goals.

A more direct approach could be to restrict the number of practices on contracts with an explicit cap. This would likely also involve a tradeoff with a reduced ability to achieve conservation goals. More importantly, such a restriction would only change the incentives and outcomes for the largest and most complex contracts. For example, if contracts were restricted to having no more than 10 practices, then contracts with fewer practices would face no change in incentives that lead to dropped practices. As noted,

most contracts have fewer than five practices, so it would require a very restrictive rule on contract size to have an impact on a majority of contracts.

The less direct approach would be to adjust the conservation planning process to encourage contracts with fewer practices by addressing only the most significant resource concerns on a given field. There are at least two potential costs to this approach. The first would arise if the approach, by shrinking the average contract, resulted in more contracts overall and increased demands on technical assistance resources. A second cost would arise if adding constraints to the planning process discouraged participation in the program overall.

There are also many aspects of contract structure that we were not able to evaluate due to the substantial variability across contracts. For example, our statistical analysis did not look at timing of practice implementation as an explicit choice in structuring contracts. For practice types with high rates of cancellations, the program may benefit by requiring practices with higher risks of being dropped to be implemented in earlier years than practices with lower risks of being dropped. Whether such a rule would be effective would largely depend on how often such pairings of practices are possible. In some cases, a given sequencing of practices is necessary to properly address the identified resource concerns.

We have also looked at contract structure independently of unit costs. However, the literature on contracts suggests that one solution to the challenge of maximizing program net benefits when some participation incentives are unobserved is to offer a menu of contracts with different payment rates. In the context of EQIP, this might mean structuring initiatives so that they offer not just a menu of practices—each with a single unit cost—but instead allow producers to choose between several different bundles of practices with alternative unit costs. A very simple version of this would pair a practice with very low private on-farm benefits and a high rate of being dropped—say, a wildlife watering facility—with a practice with sizable private, on-farm benefits and a low rate of being dropped—for instance, an irrigation sprinkler. Producers could choose between two alternative contracts, an option in which the irrigation sprinkler is offered alone at a payment rate that reflects, in effect, a 50-percent cost share, or an option in which the wetland practice is bundled with the sprinkler and the cost share on the sprinkler is increased to 65 percent. This bundling of practices paired with alternative payment rates is an effective sorting mechanism used in a variety of contract settings. Our general finding that contract structure matters and is likely related to strategic behavior suggests that future research could find alternative approaches for identifying and evaluating such forms of contract structure.

Conclusions

USDA's Environmental Quality Incentives Program (EQIP) relies on contracts with producers that specify the adoption of specific conservation practices at specific times, in agreed-upon locations, with a specified level of financial assistance. Many of these contracts are complex, involving multiple conservation practices. The large majority of practices on EQIP—78 percent of practices included in contracts signed in fiscal 2010—were implemented as planned. Some of the other practices were dropped from the contracts, often without replacement by another practice. This report examined patterns in terms of the types of practices that were dropped most often. The aim of this research is to provide insights for program managers and others as they pursue efforts to reduce the frequency of dropped practices.

Some degree of practice dropping is necessary in a complex contracting environment, where contracts span multiple years and include multiple practices. Program managers and producers need some flexibility to be able to adapt as on-the-ground conditions and information change over the life of the contracts. By examining evidence from stated reasons for contract modifications, this report showed that only about a third of dropped practices are clear-cut cases of adaptive management. This suggests that there may be structural—and potentially correctable—reasons for many of the other dropped practices.

We find that practices with higher private on-farm benefits (benefits that accrue to the producer), based on a number of indirect measurements of those benefits, were less likely to be dropped. We also find that the most popular or common practices were on average also the least likely to be dropped. Even if current levels of dropped practices are within acceptable bounds for the program, data on different completion rates across practices can be helpful to program managers. Lower completion rates can reveal where the current payment rates, practice standards, or other drivers of private net benefits may both discourage inclusion of practices on contracts and lead to those practices being dropped more frequently.

The report discusses the role that unit cost payment rates can play as a driver of dropped practices. We find mixed evidence on the role of higher payment rates, with examples of higher unit cost payment levels associated with both higher and lower rates of dropped practices. This suggests that the effects of higher payment rates will depend upon other differences in unrevealed incentives, both producers' costs and on-farm benefits.

While prior research has examined the roles of ranking mechanisms and payment levels on practice adoption and completion, this report expands the literature by examining the role of contract structure. We use an econometric model to estimate the impact of contract structure on the rate at which practices are dropped and find that reducing the number of practices on contracts may reduce the frequency of contracts with dropped practices.

Overall, this report provides a very broad look at the interaction of incentives and practices on conservation contracts. One revealing aspect of the research is that, given the considerable complexity of working lands programs, there are a variety of possible policy design changes in ranking criteria, restrictions on contract structure, use of bundles of practices at different cost-share rates, and changes to cost-share rates that have the potential to address the challenge of unrevealed incentives.

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Appendix

Detailed Presentation of Contract Status and Practice Status Data

From the original 36,499 contracts for 2010, 79 percent had been completed by the spring of 2014, some of which (4,983) had already been completed by the end of the 2010 fiscal year (table A1). Another 11 percent of contracts (3,929) were still listed as active in 2014. About 9 percent of contracts (3,347) had been cancelled, and 1 percent had been terminated. A very small percentage of contracts (about 0.01 percent, or four contracts)) had been moved from completed status to cancelled status, perhaps due to failure to maintain practices.

Table A1

Status of 2010 contracts originally and in 2014

Original (2010) contract status		Final (2014) contract status			
		Active	Completed	Cancelled	Terminated
In-study sample	Active	3,929	23,765	3,343	475
	Completed		4,983	4	
Out-of-study sample	Cancelled			207	
	Terminated				9

Note: Contracts that were coded as cancelled or terminated in 2010 are not typically reported in official fiscal year contracts. However, these contracts were signed prior to being cancelled or terminated.

Source: USDA, Economic Research Analysis of Natural Resources Conservation Service ProTracts data for EQIP contracts.

The numbers on practice status look slightly different if we take account of practices that were originally planned for 2014 or later or delayed to 2014 or later. In this case, the certification rates rise to almost 83 percent, but the dropped practices rate remains essentially unchanged at 14 percent. In other words, if we ignore practices that are still expected to be planned for the future based on the revised planned year, our picture of practice certification changes, but our picture of dropped practices does not.

The act of delaying practices has some significance as a form of contract modification. Only 2.6 percent of practices were originally planned for 2014 or later, but 3.8 percent were delayed to 2014 or later. As expected, most (84.2 percent) of these delayed practices are listed as “planned” as of 2014.

For the three practice status codes that represent contract modifications, the differences between the practices originally planned for before 2013 and practices originally planned for 2014 or later are not dramatic. The shares of practices deleted, cancelled, or terminated are essentially unchanged across the two samples. Only for the delayed practices do the rates of dropped practices decline. For all of these groups, practice cancellations are somewhat more common than practice deletions, and practice terminations are relatively rare.

Table A2

Practice status in 2014 for fiscal year 2010 EQIP contracts

Practice status	Planned year		Originally		Delayed to		Total	
	2010 - 2013, (not delayed beyond 2013)		2014 or later		2014 or later			
Certified	130,001	82.6%	1,404	32.1%	508	8.0%	131,913	78.4%
Partially-certified	124	0.1%	9	0.2%	62	1.0%	195	0.1%
Planned	4,429	2.8%	2,312	52.8%	5,347	84.2%	12,088	7.2%
Cancelled	11,662	7.4%	329	7.5%	223	3.5%	12,214	7.3%
Deleted	9,678	6.1%	268	6.1%	177	2.8%	10,123	6.0%
Terminated	1,573	1.0%	55	1.3%	33	0.5%	1,661	1.0%
Dropped	22,913	14.6%	652	14.9%	433	6.8%	23,998	14.3%
Total	157,467		4,377		6,350		168,194	

EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service analysis of Natural Resources Conservation Service ProTracts data.

Note: Analysis is for practices that were originally on contracts that were either active or completed at the end of the 2010 fiscal year. New practices that were subsequently added to these contracts are not included.

Details of Contract Structure Analysis

This positive correlation between contract ranking and all four contract structure variables suggests that without proper statistical controls, an ordinary least squares estimation of the effect of contract structure on the likelihood that a practice is dropped would be biased. To correct for this, we use a suite of instrumental variables that are likely to be related to contract structure but that, conditional on other variables, should not influence the likelihood that a practice is dropped. These instruments capture the competitive pressure that a given contract faced.

We use the number of contracts in the fund code (initiative) in which a contract appears as an indication of the competitive pressure that the offer would have faced. A much better measure would be the total number of applications to a given fund code, but data on rejected applications is not retained in ProTracts. Larger initiatives are indicative of greater competition. We expect that larger initiatives will therefore be associated with contracts that are larger or more complex in order to improve ranking.

Several features would give a contract a potential ranking advantage and so would also be expected to be associated with less complex and smaller contracts. In many initiatives, a contract with more resource concerns identified is more likely to have a higher ranking, since many points in the ranking process can only be assigned if a given resource concern is present. When a contract is located in a priority area, it can improve ranking, as can being livestock related.

A third set of variables relates to the source of variation. Indicators for whether the farmer is a beginning, limited resource, or socially disadvantaged farmer may influence contract structure, both for ranking reasons and for reasons related to the ability of the farm to bear the costs associated with a larger or more complex contract.

The instrumental variables model results are shown in table A3. For each of the six outcome variables, the test of exogeneity (Wu-Hausmann) strongly rejects the Ordinary Least Squares model in favor of the instrumental model. There are, however, two weaknesses in the instrumental variables model. First, the model only explains a small amount of the total variation in contracts with dropped practices. Second, for three of the models, a Sargan over-identification test rejects the null hypothesis that all of the instruments are valid. These tests suggest that future research should examine alternative model specifications. The similarities in findings between the three models that pass both the exogeneity and over-identification tests and the three models that pass only the exogeneity test suggests that the results in the current specification provide some meaningful insight into the role of contract structure.

For dropped practices, there is a predicted 2.4-percentage-point decrease in response to a 1-percent increase in acreage (table A3). For terminated and cancelled practices, as well as deleted practices with an added practice, the relationship is also negative and statistically significant. One possible explanation for this relationship is that larger contracts could be associated with either multiple farms or with larger farms that are less likely to require a cancellation or termination due to an economic hardship. Interestingly, the role of acreage is reversed in looking only at deleted practice. This may indicate that practices that increase acreage in order to increase ranking are also the most likely to be dropped. This relationship could be a topic for future analysis, but the overall results also imply, as discussed below, that restrictions on acreage could have offsetting effects on deletions versus on terminations and cancellations.

Larger contracts in terms of cost are more consistently associated with a decrease in the likelihood of a practice being dropped, deleted, or deleted without an added practice.

In terms of complexity, longer duration is associated with a decrease in the probability of dropped practices. However, the relationship between years on a contract and contract modifications is noisy and may not be easily explained by strategic behavior. The positive relationships revealed in the non-causal model may be reflective of a greater role of adaptive management on longer contracts, but in all of those cases the associated change in probabilities is small.

Last, among the four aspects of contract structure, the most consistent finding across models and outcomes is that contracts with more practices are more likely to have dropped practices. The addition of one more practice to a contract is associated with a 12.2-percentage-point increase in the probability of a dropped practice, a 5.4-percentage-point increase in the probability of a deleted practice, and a 2.4-percentage-point increase in the probability of a deleted practice without an added replacement practice. These findings are highly consistent with strategic behavior and suggest that one approach to reducing strategic behavior may be to focus the program on simpler contracts.

Table A3
 Estimated impact of contract structure on likelihood of dropped practices

Variable	Dropped	Terminated	Cancelled	Deleted	Deleted with added practice	Deleted without added practice
ln(cost)	-0.097**	0.012	-0.015	-0.092***	-0.033**	-0.06***
ln(acres)	-0.024**	-0.011***	-0.028***	0.013**	-0.001	0.014***
Duration	-0.424***	-0.081***	-0.303***	-0.048	-0.079***	0.031
Practices	0.122***	0.012***	0.059***	0.054***	0.030***	0.024***
Observations	27,252	27,252	27,252	27,252	27,252	27,252
Wald Test	237.29	35.55	42.94	661.54	244.60	421.24
Wu-Hausmann (P)	0.000	0.000	0.000	0.000	0.000	0.000
Sargan (p)	0.022	0.204	0.108	0.005	0.1251	0.001

Note: These numbers represent the change in the probability of the outcome in each column. So, a value of 0.015 is a 1.5-percentage-point increase. Asterisks indicate statistically significant (***) $p < 0.01$, ** $p < 0.05$, * $p < 0.1$). The model for this analysis was an instrumental variables model that seeks to control for the fact that producers choose contract structure. Thus, these values reflect an estimated causal expectation about what would happen if contract size or complexity were marginally restricted.

Source: USDA, Economic Research Service statistical analysis of Fiscal Year 2010 EQIP contracts in the Natural Resources Conservation Service ProTracts database.

Table A4
EQIP 2010 Practice Codes and Names by ERS Category (part 1 of 7)

Air Quality				
Code	Practice Name	Type	Total	Dropped
606	Subsurface Drain	S	793	15.5%
723	Engine Replacement	S	573	2.3%
370	Atmospheric Resource Quality Management	M	144	10.4%
729	Dust Control on Unpaved Roads and Surfaces	M	48	25.0%
607	Surface Drain, Field Ditch	S	23	21.7%
752	Orchard and Vineyard Air Quality Management	M	17	0.0%
608	Surface Drain, Main or Lateral	S	13	30.8%
366	Anaerobic Digester	S	5	40.0%
365	Anaerobic Digester, Ambient Temperature	S	1	
Energy				
Code	Practice Name	Type	Total	Dropped
633	Waste Recycling	S	708	13.3%
122	Agricultural Energy Management Plan, Headquarters—Written	P	238	29.8%
716	Renewable Energy System	S	13	7.7%
737	Reduced Water and Energy Coffee Conveyance System	S	5	0.0%

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 2 of 7)

Erosion				
Code	Practice Name	Type	Total	Dropped
340	Cover Crop	M	5,338	14.5%
329	Residue and Tillage Management, No-Till	M	4,032	8.0%
561	Heavy Use Area Protection	S	3,607	13.9%
342	Critical Area Planting	M	3,592	20.3%
328	Conservation Crop Rotation	M	2,508	13.7%
410	Grade Stabilization Structure	S	1,876	14.5%
600	Terrace	S	1,827	10.7%
380	Windbreak/Shelterbelt Establishment	S	1,111	12.3%
484	Mulching	M	1,007	23.4%
638	Water and Sediment Control Basin	S	894	12.2%
345	Residue and Tillage Management, Reduced Till	M	588	7.0%
327	Conservation Cover	M	460	22.2%
650	Windbreak/Shelterbelt Renovation	S	341	13.8%
466	Land Smoothing	S	305	11.8%
386	Field Border	S	262	24.8%
344	Residue Management, Seasonal	M	246	51.2%
468	Lined Waterway or Outlet	S	197	26.4%
330	Contour Farming	S	105	31.4%
751	Individual Terrace	S	74	27.0%
601	Vegetative Barrier	S	69	8.7%
346	Residue and Tillage Management, Ridge Till	M	66	12.1%
331	Contour Orchard and Other Perennial Crops	S	63	27.0%
462	Precision Land Forming	S	44	9.1%
585	Stripcropping	M	44	6.8%
557	Row Arrangement	M	38	36.8%
603	Herbaceous Wind Barriers	S	8	25.0%
332	Contour Buffer Strips	S	4	
609	Surface Roughening	M	2	
572	Spoil Spreading	M	0	

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 3 of 7)

Excess Water				
Code	Practice Name	Type	Total	Dropped
620	Underground Outlet	S	2,463	14.2%
587	Structure for Water Control	S	2,155	18.3%
362	Diversion	S	630	29.7%
558	Roof Runoff Structure	S	611	21.3%
356	Dike	S	187	12.8%
554	Drainage Water Management	S	82	43.9%
423	Hillside Ditch	S	27	48.1%
753	Infiltration Ditches	S	7	14.3%
402	Dam	S	6	33.3%
582	Open Channel	S	6	0.0%
310	Bedding	S	4	
630	Vertical Drain	S	4	
640	Waterspreading	S	4	
570	Stormwater Runoff Control	S	2	

Fish and Wildlife				
Code	Practice Name	Type	Total	Dropped
646	Shallow Water Development and Management	M	2,734	16.8%
645	Upland Wildlife Habitat Management	M	1,786	18.2%
575	Animal Trails and Walkways	S	416	21.6%
643	Restoration and Management of Rare and Declining Habitats	S	398	16.1%
647	Early Successional Habitat Development/Management	M	372	13.7%
422	Hedgerow Planting	S	186	30.1%
644	Wetland Wildlife Habitat Management	M	104	19.2%
395	Stream Habitat Improvement and Management	S	39	20.5%
396	Aquatic Organism Passage	S	12	0.0%
659	Wetland Enhancement	S	8	50.0%
657	Wetland Restoration	S	7	42.9%
734	Fish and Wildlife Structure	S	6	0.0%
142	Fish and Wildlife Habitat Plan - Written	P	4	
658	Wetland Creation	S	2	
397	Aquaculture Ponds	S	1	
398	Fish Raceway or Tank	S	1	
656	Constructed Wetland	S	1	

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 4 of 7)

Forest Resources				
Code	Practice Name	Type	Total	Dropped
666	Forest Stand Improvement	S	4,633	9.7%
612	Tree/Shrub Establishment	S	1,971	16.2%
106	Forest Management Plan - Written	P	1,205	8.8%
Irrigation				
Code	Practice Name	Type	Total	Dropped
449	Irrigation Water Management	M	3,424	16.2%
533	Pumping Plant	S	3,271	16.8%
442	Sprinkler System	S	2,122	6.0%
430DD	Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	S	1,945	12.4%
441	Irrigation System, Microirrigation	S	1,118	13.4%
430EE	Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic	S	922	10.1%
464	Irrigation Land Leveling	S	694	6.5%
443	Irrigation System, Surface and Subsurface	S	234	12.8%
351	Water Well Decommissioning	S	202	13.4%
431	Above Ground, Multi-Outlet Pipeline	S	200	21.5%
428A	Irrigation Water Conveyance, Ditch and Canal Lining, Plain Concrete	S	133	6.0%
552	Irrigation Regulating Reservoir	S	109	25.7%
430FF	Irrigation Water Conveyance, Pipeline, Steel	S	78	42.3%
447	Irrigation System, Tailwater Recovery	S	73	20.5%
436	Irrigation Reservoir	S	51	7.8%
636	Water Harvesting Catchment	S	19	15.8%
388	Irrigation Field Ditch	S	14	0.0%
780	Irrigation Water Conveyance, Corrugated Metal Pipeline	S	10	10.0%
118	Irrigation Water Management Plan - Written	P	7	71.4%
776	Irrigation Water Conveyance, On-Ground Aluminum Pipeline	S	7	0.0%
348	Dam, Diversion	S	4	
428B	Irrigation Water Conveyance, Ditch and Canal Lining, Flexible Membrane	S	3	
450	Anionic Polyacrylamide (PAM) Application	M	2	
755	Well Plugging	S	2	
320	Irrigation Canal or Lateral	S	1	
430CC	Irrigation Water Conveyance, Pipeline, Nonreinforced Concrete	S	1	

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 5 of 7)

Livestock				
Code	Practice Name	Type	Total	Dropped
382	Fence	S	11,366	14.8%
614	Watering Facility	S	8,722	14.5%
516	Livestock Pipeline	S	7,284	14.7%
528	Prescribed Grazing	M	5,791	17.3%
512	Forage and Biomass Planting	S	5,440	18.3%
642	Water Well	S	1,927	16.1%
472	Access Control	S	1,877	14.6%
490	Tree/Shrub Site Preparation	S	1,593	20.7%
378	Pond	S	1,487	22.7%
550	Range Planting	S	841	21.8%
634	Waste Transfer	S	682	13.6%
574	Spring Development	S	542	29.5%
511	Forage Harvest Management	M	464	18.3%
591	Amendments for the Treatment of Agricultural Waste	M	301	15.9%
316	Animal Mortality Facility	S	190	9.5%
629	Waste Treatment	S	102	13.7%
632	Waste Separation Facility	S	85	18.8%
110	Grazing Management Plan - Written	P	59	13.6%
548	Grazing Land Mechanical Treatment	M	22	22.7%
381	Silvopasture Establishment	S	16	12.5%
717	Livestock Shade Structure	S	15	40.0%
592	Feed Management	M	7	28.6%
Nutrient Management				
Code	Practice Name	Type	Total	Dropped
590	Nutrient Management	M	11,489	17.9%
102	Comprehensive Nutrient Management Plan - Written	P	844	10.4%
747	Denitrifying Bioreactor	S	2	
Organic				
Code	Practice Name	Type	Total	Dropped
138	Conservation Plan Supporting Organic Transition - Written	P	131	55.0%
Recreation				
Code	Practice Name	Type	Total	Dropped
655	Forest Trails and Landings	S	352	13.1%
654	Road/Trail/Landing Closure and Treatment	S	4	

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 6 of 7)

Riparian

Code	Practice Name	Type	Total	Dropped
412	Grassed Waterway	S	1,548	15.8%
578	Stream Crossing	S	736	22.0%
580	Streambank and Shoreline Protection	S	307	11.4%
391	Riparian Forest Buffer	S	128	18.8%
322	Channel Bank Vegetation	S	71	16.9%
390	Riparian Herbaceous Cover	S	47	25.5%
584	Channel Bed Stabilization	S	26	19.2%

Safety

Code	Practice Name	Type	Total	Dropped
560	Access Road	S	758	19.1%
527	Karst Sinkhole Treatment	S	16	25.0%

Soil Problems

Code	Practice Name	Type	Total	Dropped
610	Toxic Salt Reduction	S	76	27.6%
324	Deep Tillage	M	58	15.5%

Vegetation

Code	Practice Name	Type	Total	Dropped
595	Integrated Pest Management (IPM)	M	7,400	13.8%
314	Brush Management	M	6,162	10.4%
798	Seasonal High Tunnel System for Crops	S	2,121	17.2%
338	Prescribed Burning	M	1,063	23.6%
384	Woody Residue Treatment	M	954	13.4%
394	Firebreak	S	714	23.9%
500	Obstruction Removal	S	415	12.0%
797	Invasive Plant Species Control	S	412	12.1%
660	Tree/Shrub Pruning	M	361	10.0%
460	Land Clearing	S	262	5.3%
317	Composting Facility	S	240	14.2%
635	Vegetated Treatment Area	S	133	27.8%
383	Fuel Break	S	122	18.0%
718	Precision Pest Control Application	M	57	10.5%
379	Multi-Story Cropping	S	52	11.5%
311	Alley Cropping	S	8	37.5%
114	Integrated Pest Management Plan - Written	P	1	

Table A4

EQIP 2010 Practice Codes and Names by ERS Category (part 7 of 7)

Water Quality				
Code	Practice Name	Type	Total	Dropped
313	Waste Storage Facility	S	1208	10.2%
309	Agrichemical Handling Facility	S	177	14.1%
367	Roofs and Covers	S	166	13.3%
360	Waste Facility Closure	S	128	10.9%
393	Filter Strip	S	112	24.1%
350	Sediment Basin	S	83	31.3%
521D	Pond Sealing or Lining, Compacted Clay Treatment	S	35	25.7%
521A	Pond Sealing or Lining, Flexible Membrane	S	28	28.6%
521B	Pond Sealing or Lining, Soil Dispersant	S	14	50.0%
359	Waste Treatment Lagoon	S	8	12.5%
706	Shellfish Aquaculture Management	M	7	14.3%
521C	Pond Sealing or Lining, Bentonite Sealant	S	6	33.3%
353	Monitoring Well	S	3	
749	Waste Field Storage Area	S	2	
355	Well Water Testing	M	1	
Administrative and Planning				
Code	Practice Name	Type	Total	Dropped
911	TA Design	P	691	17.4%
912	TA Application	P	588	23.1%
913	TA Check-Out	P	577	21.8%
799	Monitoring and Evaluation	S	183	35.5%
910	TA Planning	P	2	

EQIP=Environmental Quality Incentives Program.

Source: USDA, Economic Research Service analysis of Natural Resources ProTracts data.