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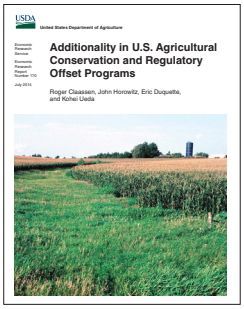

Find the full report at *www.ers.usda.gov/publications/err-economic-research-report/err170*

Additionality in U.S. Agricultural Conservation and Regulatory Offset Programs

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What Is the Issue?

The Federal Government spent more than $6 billion in fiscal year 2013 on voluntary conservation payment programs to encourage the adoption of a wide range of conservation practices that address multiple environmental and resource conservation goals. Conservation payments can also come from private industry, particularly in the context of an agricultural offset market established as part of a cap-and-trade system designed to reduce nutrient or greenhouse gas (GHG) emissions. Payments lead to improvement in environmental quality only if farmers and ranchers who receive them adopt conservation practices that would not have been adopted without the payment.

When a voluntary payment causes a change in practice(s) that leads to improved environmental quality, these changes are "additional." For any type of voluntary payment, there is some risk that the farmers or ranchers who receive them would have adopted the required practice(s), even without the payment. This study measures additionality for a number of common conservation practices typically supported by voluntary conservation payments and examines ways to increase additionality.

What Did the Study Find?

Additionality depends largely on the characteristics of the practices support by conservation payments. Practices that are expensive to install or provide only limited onfarm benefits are unlikely to be adopted without payments. Practices that can be profitable are much more likely to be adopted without payments, although the costs and benefits of these practices can vary widely across farms. Many farms, for example, have adopted conservation tillage without receiving conservation program payments, while other farms have not. Two broad categories of conservation practices are considered:

- **Structural and vegetative practices:** Additionality is high (roughly 80 percent) for structural and vegetative practices such as terraces and grassed waterways. These practices typically have high installation costs and offer limited onfarm benefits, at least in the short run. Most farmers and landowners are unlikely to install them without assistance.

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- **Conservation management practices:** Additionality results are mixed. We estimate that conservation tillage, when supported by payments, is just over 50 percent additional—considerably lower than for either category of structural practices. Our analysis of nutrient management supported by conservation program payments shows that farmers who receive payments are much more likely to have written nutrient management plans than farmers who did not receive payments. Results are less clear, however, for implementation of actual nutrient management practices. Farmers who received payments applied only 1.2 percent of nitrogen fertilizer (on average) in the fall before planting corn, while we estimated that they would have applied 12 percent of nitrogen in the fall, on average, without a payment. It is not clear, however, that corn farmers who received payments applied less nitrogen or were more likely to apply it after planting, when crop uptake is greatest.

Similar results are obtained in our analysis of nutrient management practices (reduced nitrogen application) supported through a hypothetical offset market. In our simulation, credits are earned by applying nitrogen below a "prevailing practice" baseline rate. If the offset credits sell for $15/metric ton (tonne) of carbon dioxide equivalent (CO_2-e), 30 percent of the credits would be additional. At a credit price of $35/tonne CO_2-e, additionality would increase to 50 percent or more. Nonadditionality arises because farming practices (nitrogen application rates) differ greatly across farms that appear to be similar, given the data used in our analysis.

While complete additionality cannot be ensured, it may be possible to design programs to increase it. In conservation programs, additionality could be increased by putting higher priority on practices that are less likely to be undertaken without payment support. However, if those practices are also more costly or produce less environmental benefit (when they are additional), greater additionality may not be cost effective. In a GHG offset program, additionality can be increased by limiting eligibility to regions where additionality is more likely than in other regions, but it also must be weighed against higher costs.

How Was the Study Conducted?

For existing conservation programs, additionality is estimated using propensity score matching with data from the 2009-2011 Agricultural Resource Management Survey (ARMS), which is sponsored jointly by USDA's Economic Research Service and National Agricultural Statistics Service. Once a farmer has received a conservation payment, we cannot observe what the farmer would have done without the payment. To estimate what the farmer might have done without the payment, we look at very similar or "matching" farms that have not received payments. The action taken by these matching farms, on average, is our estimate of what the farmer who received the payment would have done without the payment. The difference between the action taken, given the payment, and the action that would have been taken without the payment is a farm-specific measure of additionality. The measures we report are the average additionality across farms receiving payments. Units of measurement depend on the action taken. For nitrogen application rate changes due to payments for improved nutrient management, for example, additionality is measured in pounds (lbs) per acre of applied nitrogen. For practice adoption (e.g., conservation tillage) additionality is the probability that the adopted practice is, in fact, additional. For conservation tillage, additionality of 0.50 means that half of the conservation tillage practices supported by payments are additional.

For the offset credit analysis, we model producer response to hypothetical offset payments and estimate participation using the 2009 wheat and 2010 corn data from ARMS. Using ARMS data and nitrogen yield response functions drawn from the literature, we estimate the number of offset credits that would be provided by each farm, the proportion of the credits that would be additional, and the cost of providing those credits. We use a "prevailing practices" baseline, which is the average nitrogen application rate for farms in a small area with relatively uniform soils and climate. We analyze a number of "safety margins" (more stringent baselines or other eligibility criteria meant to reflect a conservative estimate of business-as-usual practices) to estimate the effect of these program design options on additionality.