As global demand for food and fuel grows, the potential tradeoff between agricultural production and environmental quality has renewed urgency. While grain and soybean prices have retreated from previous peaks, demand for food and fuel remains strong and prices continue at levels well above their 2004 to 2006 averages. These market signals are encouraging the use of additional land, water, and other inputs in crop production. If pursued without caution, however, increasingly intensive agricultural production can damage land, deplete water resources, and degrade the environment.

Environmental protection often requires government intervention. Agricultural producers generally do not receive a financial benefit from using production methods that could protect or improve the environment downstream or downwind. Unless these methods are also the most profitable way to farm, producers have no tangible incentive to adopt them. Because nonpoint source pollution processes such as nutrient runoff cannot be directly observed, farmers and ranchers may not even realize the environmental effect of their actions. Federal agricultural conservation policy seeks to provide incentives for environmental protection where markets have failed to do so.

Agricultural conservation policy is implemented largely through voluntary programs that offer economic incentives for the adoption and use of environmentally sound practices. Between 2008 and 2012, an estimated $25 billion will be spent on USDA conservation programs. Perhaps the most basic questions in the design and implementation of voluntary programs are how much will be paid, to which producers, for taking what actions?

The answers depend, to some extent, on your point of view. As an economist, I usually look at conservation programs through the lens of environmental cost-effectiveness. Because USDA conservation programs generally have multiple objectives and are limited by budget or acreage caps, I use the term “cost-effective” to describe programs that yield as much environmental benefit as possible, given the budget or acreage cap (see Cattaneo et al. 2005). That means getting as much conservation as possible out of every dollar spent and every acre enrolled.

Benefit-cost targeting is essential to cost-effective conservation. Targeting means giving priority to some producers (farms and fields) and actions (conservation practices applied on those farm and fields) over others. Cost-effectiveness can be achieved only by focusing funds on producers and actions that can yield a high level of environmental benefit per dollar of program expenditure.

While benefit-cost targeting is easy to describe, it is hard to do. Biophysical research on the connection between agriculture and environmental quality shows that spreading conservation effort evenly across the landscape is seldom (if ever) cost-effective. The gain in environmental quality flowing from application of a given conservation practice (or practices) can vary widely across farms and fields, even within a small geographic area. To cost-effectively reduce nitrogen loads to the Gulf of Mexico, for example, program managers must be able to identify the farms and fields where nitrogen loads are most likely to originate and the practices most likely to reduce nitrogen runoff.

Economic research on the value of various environmental amenities (e.g., wildlife and water quality) shows that these values can also vary. For example, valuation research can yield insight on our collective preference for wildlife relative to water quality. The value of environmental amenities, expressed in dollar terms, represents our collective “willingness to pay” for environmental quality. That isn’t to say that the federal government or anyone else should charge for the use of environmental amenities. That isn’t always practical or even desirable. But it does represent a measure of our willingness to put real resources into protecting the environment.

Cost-effective conservation also requires a frugal approach to the use of program funds. Cost-effective payments must leverage a change in conservation behavior that would not have happened without the payment. Payments that don’t leverage a change in conservation behavior also be just large enough to leverage the desired change. That means using the least expensive practice that can do the job and obtaining changes in conservation behavior for the lowest possible payment incentive. Larger payments benefit individual program participants but also use up budget resources that could leverage additional conservation effort on other farms.

The difficulty in implementing a targeted program is in identifying an appropriate, transparent, and easy to use metric for weighing various conservation opportunities in the allocation of limited conservation program resources. On one hand, the method must incorpo-
rate complex economic and biophysical information. On the other hand, methods that are very expensive to implement may not be worth the effort. Devising a benefit-cost metric is particularly difficult because of the size and heterogeneity of US agriculture: thousands of farmers and ranchers manage more than 900 million acres of agricultural land under widely varying conditions.

Environmental benefit-cost indices have been used by USDA since the early 1990s to rank conservation program applications. The Environmental Benefits Index (EBI), used to rank applications for Conservation Reserve Program (CRP) general signup since 1991, has proven to be an effective tool for improving the cost-effectiveness of the CRP. Feather et al. (1999) showed that use of the EBI increased annual CRP benefits by $370 million—an increase in benefits that is equal to about 25% of program cost—while leaving program costs largely unchanged. Environmental indices have also been adapted for use in other USDA programs, including the Environmental Quality Incentives Program and the Conservation Security Program.

While the EBI has increased CRP benefits, changes in the index could further increase benefits. The current EBI gives equal weight to soil erosion reduction, water quality, and wildlife habitat. Feather et al. (1999) showed that the benefits of water quality and wildlife habitat exceed the soil productivity benefits of reducing soil erosion. Although sediment can damage water quality, it may be more cost-effective to address this issue through the EBI factor on water quality rather than a separate soil erosion factor. The soil productivity benefits can be captured by individual farmers and landowners. The case for government intervention is strongest when farmers and landowners have no private incentive to take action.

Moreover, careful attention to spatial variation in benefits and costs, even in small geographic areas, could yield substantial returns. In the Conservation Reserve Enhancement Program (CREP), for example, efforts are focused on improving the quality of a specific environmental resource (e.g., a river or lake) through the application of conservation practices in a specific area (e.g., a watershed). Within these areas, however, conservation effort is not necessarily targeted where it would be most cost-effective. Research on an Illinois CREP project, using both biophysical and economic models, has shown that sediment reduction goals could have been met at a much lower cost using benefit-cost targeting within the CREP project area (see Yang et al. 2003).

Finally, in designing conservation program incentives to work in conjunction with environmental benefit-cost indices, a critical challenge is to encourage producers to (1) offer relatively cost-effective conservation treatments and (2) reveal the lowest payment they would accept for undertaking these treatments. Competitive auctions have been used to encourage agricultural producers to offer high benefit treatments at the lowest possible cost. In the Conservation Reserve Program general signup, for example, producers can improve their ranking by offering to establish land cover that is more effective as wildlife habitat (e.g., trees or shrubs instead of grass) and by offering to take a payment below a field-specific maximum rate offered by USDA.

Evidence suggests that competitive bidding in current programs may not be holding the line on costs. In theory, competition among producers for limited program enrollment will prompt them to offer more effective conservation treatments and shave payment bids to the minimum. In reality, recent research on CRP bidding indicates that producers who receive high environmental scores or who are offering low productivity (low cost) land know that they will likely compare favorably with other bidders and are less likely than others to offer discounts from the maximum payment rate (see Kirwin et al. 2005). In programs with repeated signups (including CRP), producers may form expectations about acceptable index scores from previous signups—information they can use in calibrating bids to maximize their own return to conservation program participation. In this respect, policy makers and program managers face a tradeoff in deciding how much information to give producers. Revealing environmental ranking criteria can help producers recognize how their actions could improve environmental quality, but producers may be less inclined to discount the payment they are willing to accept if they believe they have a good chance of acceptance without improving their offers. Auction research is ongoing and the potential of auctions to improve conservation program cost-effectiveness could be large.

Strong demand for agricultural products, if sustained, will make effective conservation programs more important than ever. As production intensifies and the potential for environmental damage grows, the need for effective conservation measures will also increase. While benefit-cost targeting and competitive bidding have already improved the cost-effectiveness of USDA conservation programs, the evidence suggests that their full potential has not been realized. Increasing cost-effectiveness will not be easy, but it may be essential to maintaining and improving environmental quality.

REFERENCES


