

## Lessons Learned and Potential Roles for Government

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Producers have opportunities to sell environmental services in a number of well-functioning markets (table 5.1). EPA is encouraging States to use the Clean Water Act's permit program to establish markets for pollution discharge allowances and to include agriculture in these markets. Producers can sell credits for greenhouse gas reductions on the Chicago Climate Exchange and in a growing number of retail carbon markets. Wetland mitigation markets are operating in many States, and the concept has been expanded to protect endangered species habitat. Fee hunting operations are commonplace in a few States and demonstrate that producers can earn substantial income that could be used to support wildlife habitat. Organic labeling is well established, and food labels are expanding to include information related to the provision of a wider set of public goods on farms.

Overall, however, farmer participation in these markets has been limited. Part of the reason is that many of the markets themselves are limited in scope. Experiences with these markets have also identified a number of impediments that limit producers' participation. Many of these impediments are unlikely to be overcome without direct involvement by government, including USDA. USDA has already identified some of the actions it can take to assist in the development of markets and to increase farmer participation (see box, "USDA Commitments to Markets for Environmental Services"). Economic theory and experience with the markets described in the case studies highlight a number of issues that are of primary importance in the successful creation of markets for environmental services.

### Issue: Performance of Management Practices

One of the biggest issues facing producers who wish to participate in markets for environmental services is uncertainty about the environmental performance of conservation practices, such as conservation tillage, riparian buffers, and nutrient management. In emissions trading and offset markets, uncertainty about the quantity of credits that can be supplied reduces demand for environmental services from agriculture. Markets often try to account for this uncertainty by requiring that a lost unit of wetland services or a point-source unit of pollution discharge be replaced or mitigated with two or more units of services (credits) from farms. This practice essentially increases the price of mitigation to buyers and reduces overall demand for farmer-produced credits.

Uncertainty of practice performance also affects the potential supply of environmental services. Uncertainty about the quality or quantity of the environmental services a farm can produce makes it difficult for producers to decide the long-term economic benefit of investing in a wetland mitigation bank, to make wildlife habitat improvements for a fee hunting business, to enter an emissions trading market, or to enter the organic market. Uncertainty about the impact of a new practice on crop yields can also affect a farmer's decision to implement a practice in order to enter a market. In the case of the

Table 5.1

**Summary of existing markets for environmental services and some important characteristics**

Market	Water quality trading	Chicago Climate Exchange	Retail carbon market	Wetland mitigation banking	Organic labeling	Fee hunting
<b>Environmental service</b>	Water quality	Reductions in net greenhouse gas emissions	Reductions in net greenhouse gas emissions	Wetland services	Various (water quality, biodiversity, air quality)	Wildlife
<b>Good traded</b>	Discharge allowance	Carbon credit	Carbon credit	Qualified wetland acreage	Agricultural food, fiber, and other products	Access to land
<b>Source of property right</b>	Regulatory agency	CCX rules	Retail carbon provider	Regulatory agency	Private good	Private good
<b>Source of demand</b>	Regulatory discharge cap on point sources	Legally binding discharge cap on member firms	Private sentiment	Legally binding no-net loss rules	Private sentiment	Private sentiment
<b>Standards?</b>	Yes	Yes	No	Yes	Partial	No
<b>Steps being taken to reduce uncertainty</b>	Research on performance of conservation practices, flexible rules for point sources, verification, enforcement	Research on performance of conservation practices, verification	None	Research on measuring and verifying wetland services	Uniform national standards, mandatory certification, Federal enforcement	Research on improving habitat, outreach
<b>Steps being taken to reduce transactions costs</b>	Third-party aggregator, clearinghouse, outreach, models	Third-party aggregator, models, Voluntary Greenhouse Gas Reporting Registry	Online decision aids	Third-party arbitrators	Reduction in multi-ingredient certification disputes	Outreach, clearinghouse operated by State, liability coverage
<b>Remaining impediments or issues</b>	Producer reluctance, lack of binding caps, interactions with conservation programs	Lack of national binding cap, interactions with conservation programs	Lack of standards and verification	Up-front costs and market uncertainty, interactions with conservation programs	Information overload, free-riding on environmental benefits	Public sentiment, free-riding on wildlife services

CCX=Chicago Climate Exchange.

Chicago Climate Exchange, lack of scientific evidence about a soil's ability to sequester carbon can prevent a farm from entering the market.

USDA can play a role in providing research on the effectiveness of different conservation practices for producing environmental services. USDA already provides farmers and ranchers with information on the impact of conservation practices on air, water, and wildlife habitat through sources like the NRCS Field Office Technical Guide. However, much more detailed information is needed to estimate the number of credits that might be produced for sale in emissions trading markets or the wetland services that can be sold by a mitigation bank.

USDA supports the development of tools and methods for quantifying how changes in farming practices affect environmental services (USDA, Natural Resources Conservation Service, 2006b). For example, the Nitrogen Trading

## USDA Commitments to Markets for Environmental Services

In 2006, USDA released a departmental regulation defining its policy on markets for environmental services. This policy stated that USDA would do the following:

- Cooperate with other Federal, State, and local governments to establish a role for agriculture in environmental markets.
- Find ways to make USDA policies and programs support producers wanting to participate in such markets.
- Conduct research and develop tools for quantifying environmental impacts of farming practices.

A partnership agreement between EPA and NRCS to collaborate on efforts to establish viable water quality trading markets was signed in 2007. A goal is to develop a pilot water quality trading project in the Chesapeake Bay watershed.

The Food, Conservation, and Energy Act of 2008 contained a section in the Conservation Title outlining USDA's role in support for market-based conservation. The provision required the following:

- The Secretary of Agriculture will establish technical guidelines for measuring environmental services from conservation and other land management activities, and priority will be given to developing guidelines for participation in carbon markets.
- Guidelines will be established for a registry to collect, record, and maintain information on measured benefits.
- Guidelines will be established for a process to verify that a farmer has implemented the conservation or land management activities reported in the registry.

Tool and GRACEnet can help reduce uncertainty in water quality and carbon trading markets, respectively.

Another broader effort is the Conservation Effects Assessment Project (CEAP). The goal of CEAP is to quantify the environmental benefits of conservation practices used by private landowners participating in USDA conservation programs. Field-level sampling, monitoring, and modeling are being used to estimate the impacts of conservation practices on water quality, wildlife, and soil quality. In addition, collaborative regional assessments are developing models for estimating environmental services from wetlands, including carbon storage, sediment, and nutrient reduction, flood water storage, wildlife habitat, and biological sustainability (USDA, NRCS, 2006a). CEAP also includes watershed assessment studies that are to provide a framework for evaluating and improving the performance of water quality assessment models. Such models are critical for estimating the equivalency of water quality credits that are produced in different parts of a watershed. Models that can predict the movement of chemicals carried in runoff with a degree of certainty sufficient to allow agricultural credits to be traded would make it easier for producers to participate in trading programs. Models would also allow uncertainty ratios (trading ratios that specifically reflect practice uncertainty) to be lowered, reducing the cost of agricultural credits and

making them more attractive to point sources. In addition, research sponsored by the USDA Cooperative State Research, Education, and Extension Service is also addressing practice performance in a variety of settings, as well as supporting the development of assessment tools.

Uncertainty over the economic performance of practices implemented to produce environmental services can also be overcome through risk-management instruments, such as insurance (Zeuli and Skees, 2000). Private companies could provide such instruments, but government could also offer them if an active market for environmental services is an important conservation goal and private insurance is not available.

## **Issue: Standards and Verification**

One of the requirements for a smoothly operating market is that the good being traded is of a consistent quality that is known to all. Organic agriculture and emissions trading markets have very specific standards for the services that are marketed, which is not the case for the retail carbon market and some of the newer eco-labels. Consumers may not know what they are buying or how the environmental services provided by one supplier differ from another. For example, what does “wildlife-friendly” agriculture really mean? What does it really take to eliminate the carbon footprint of an airline flight or a wedding? As long as labels and advertising are the only ways consumers have of discriminating between the ability of producers to provide environmental services, consumers are likely to be skeptical of suppliers’ claims. Third-party certification is considered the only reliable way to signal product quality claims in organic markets (Cason and Gangadharan, 2002).

USDA is playing an important role in setting standards and providing certification for organic agriculture. Standards and certification provide the assurance to consumers that the claims on the label are believable and protect producers from dilution of price premiums due to less rigorous (and less costly) applications of organic standards. The department regulation outlining USDA’s roles in “market-based stewardship” calls for USDA to cooperate with other Federal Departments and groups in developing accounting practices and procedures for quantifying environmental goods and services in other types of markets. Research on practice performance would help USDA contribute to such a role.

Verification that standards are being followed and that promised management practices are being implemented is a related issue. Many environmental services are not easily observed. Verification is based on the farming practices that have been implemented, and this often requires on-site visits. Particularly in markets created through regulation, such as water quality trading and wetland mitigation, the prospects of on-site visits by representatives of EPA or other regulatory agencies have been a deterrent to farmer participation (Breetz et al., 2004). In some markets, such as the CCX and some water quality trading programs, aggregators or other third-party service providers, rather than a government agency, verify that practices are in place. Although farmers may be less reluctant to deal with USDA-led verification for market services, such a role could put USDA at odds with its historical constituents. Experience with conservation compliance and Swampbuster (a compliance program to discourage the draining

of wetlands) would seem to bear this out. The Government Accountability Office found that almost half of all NRCS field offices were not properly verifying that producers were meeting the requirements of the compliance and Swampbuster provisions (U.S. General Accounting Office, 2003). A reluctance to assume an enforcement role was cited as one of the reasons. Improved remote-sensing technology might provide more acceptable (less intrusive) means of verification, although this practice may not be applicable for all types of management options.

Verification almost always concerns management practices or land use, rather than the environmental services that are being produced. Measuring environmental services, such as water quality, carbon sequestration, wetland functions, and wildlife, is often extremely difficult and costly. Verifying practices is much less costly and is sufficient as long as market participants accept that the expected services are actually being produced.

### **Issue: Cost of Information**

An important aspect of a market for environmental services is that participants have access to the information they need to make informed decisions. Producers need to know which markets they can participate in, how to produce the services demanded, and what the total cost to the farm business will be. Producers are not likely to have the time to research all the questions that need to be answered, given the time needed for managing the farm.

Government and other groups can reduce the costs of participating in a market by providing the necessary information. The USDA departmental regulation calls for USDA to conduct outreach, education, technology-transfer, and partnership-building activities with producers, using established institutional arrangements, to help producers participate in markets for environmental services. Many State cooperative extension offices have developed publications to help producers set up a fee-hunting business, with checklists to help identify business goals, the type of lease to offer (daily, long term, lease to a hunt club), other services to offer (bed and breakfast, guides, game cleaning), how to advertise, and how to manage risk (Chopak, 1992; Porter et al., 2007). Nongovernment organizations and private businesses that benefit by farmer participation in markets also have an incentive to reduce producers' information costs. NutrientNet and the Nitrogen Trading Tool are examples of tools that can reduce information costs, as well as uncertainty.

Educating the public presents an important step in increasing demand for environmental services. Raising the public's awareness of the potential threats from GHG emissions could increase their willingness to pay for GHG reductions in retail markets (Trexler, Kosloff, and Silon, 2006).

### **Issue: Bringing Together Buyers and Sellers**

Environmental services are produced across a diverse landscape. It may be costly for individual buyers to find all potential suppliers and to discover what each is selling, especially when the demand from a single source is much greater than the supply from a single farm. For example, a single sewage treatment plant may require nutrient credits from multiple farms to

meet its permit requirements. Similarly, it can be costly for producers to find potential buyers, many of whom may be residing some distance away.

One way that markets have addressed this issue is through formal clearinghouses that assemble information from both buyers and sellers, making it easier for potential trading partners to find each other and to gauge supply and demand. The Internet is an obvious tool that could be used to facilitate trades. For example, NutrientNet, World Resources Institute's on-line nutrient-trading tool, could play a clearinghouse role in water quality trading programs (Kramer, 2003).

Government is playing a clearinghouse role in some markets. State-operated clearinghouses make it easier for point sources and nonpoint sources to find each other in some water quality trading programs (Breetz et al., 2004). The Voluntary Greenhouse Gas Reporting Registry can help agriculture and forest entities take advantage of State- and private-sector-generated opportunities to trade emission reductions and sequestered carbon.

Third-party brokers and aggregators also play a more direct role of bringing buyers and sellers together by purchasing credits from producers and selling them to buyers. Aggregators play a critical role in the Chicago Climate Exchange and are present in some water quality trading programs. In some cases, government plays an aggregator role by purchasing credits from producers and selling them on the market (such as what North Carolina does in its Tar-Pamlico trading program). State agencies serve as third-party brokers in some wetland mitigation markets to reduce uncertainty and arbitration costs. A number of State programs purchase hunting access rights from landowners and make these available to the hunting public. Hunters can consult State-provided atlases to find hunter-accessible land, with no need to seek out the individual landowner.

## **Issue: Coordinating Conservation Programs With Markets**

Federally funded conservation programs and markets for environmental services can interact in several ways. USDA for the most part does not claim any credits in markets for environmental services that are created through practices implemented with financial assistance from conservation programs, allowing landowners to sell them. However, the WRP does not allow environmental services (such as carbon sequestration) created by wetland restoration to be sold. Markets for environmental services and conservation programs can also compete with each other for the same natural capital, driving up costs to the possible detriment of market development. For example, the WRP may, in some areas, reduce the stock of lands most suited to wetland restoration, leaving mitigation bankers with higher restoration costs.

Rules of individual markets may present conflicts with conservation programs. Many water quality trading programs do not allow producers to sell pollution reductions from practices financed through a conservation program, arguing that these improvements would have occurred without trading. This restriction is similar to the WRP example above. On the other

hand, the Chicago Climate Exchange has no such restriction and will pay producers for carbon sequestration from practices for which producers have already received payment (raising the question of additionality).

Coordinating conservation programs and environmental service markets can enhance the performance of both. In trading programs that establish a baseline on a minimum level of stewardship, targeting conservation programs, such as EQIP, at producers with the most serious environmental problems not only increases program performance, but could also increase the number of producers who are willing to enter a market. The policy simulation on pages 39-43 indicates that coordinating the CRP with fee hunting opportunities could benefit the program as well as producers and wildlife by reducing the rental rates landowners are willing to accept while increasing their efforts to improve wildlife habitat.

Of interest is the potential impact of participation in markets for environmental services on USDA's compliance programs. Conservation compliance requires farmers to meet particular soil conservation goals in order to receive program benefits. Similarly, Swampbuster requires that producers not drain wetlands as a condition for receiving program benefits. Compliance requirements may be less costly to producers if credits produced by adopting soil-conserving practices or maintaining wetlands could be sold in water quality, carbon, or other markets.

USDA has developed a partnership agreement with EPA to coordinate agency policies and activities that promote the effective use of water quality credit trading. To this end, USDA agrees to identify and remove program barriers that might impede the development of water quality trading markets. What these are, however, will depend on the rules adopted in each market. Similar agreements could be developed for other markets as well.

## **Issue: The Role of Policy**

The design and eligibility requirements of markets for environmental services can greatly affect how attractive they are to potential participants. As discussed in the "Water Quality Markets" section of chapter 4, baseline requirements can greatly influence the cost and supply of credits. As shown in the greenhouse gas case study, basing credits on *net* sequestration rather than *gross* sequestration greatly affects potential returns to producers from trading.

Major expansions in some markets (i.e., wetland services, water quality, and greenhouse gases) come only with expanded or more stringent regulations on environmental quality. The low price for carbon credits in the CCX reflects the relatively low level of demand inherent in a voluntary program. A number of water quality trading programs cited lack of trades for discharge allowances because discharge caps were too high to stimulate demand (Breetz et al., 2004). Also, in a global sense, the demand for water quality improvements from producers is currently low because few impaired watersheds have opted to implement a water quality trading program and nonpoint sources are not capped.

Increased demand for environmental services from agriculture could occur when regulations change or trading programs are expanded into new areas. Requiring agricultural sources to also meet an emissions cap in a carbon market would greatly enhance demand for sequestration and result in a much larger market. Regulating all emission sources would also address the problem of leakage that occurs when payments are based on gross sequestration rather than net sequestration. Similarly, a more vigorous water quality trading market would be realized if nonpoint sources were included under a cap just as point sources are. This practice would spur nonpoint-nonpoint trading, as well as point-nonpoint.

Because of program requirements, producers considering whether to enter the wetland mitigation market face a relatively long period between starting wetland restoration and being able to sell wetland credits. A Government interested in promoting producer participation in mitigation banks could reduce these startup costs by working with lending institutions to construct loans that provide capital in increments, negotiate flexibility on loan repayment dates (perhaps delaying loan payments until wetland credits are marketed), and guarantee loans so that producers could receive a lower interest rate.

## **Markets Are Not Always the Answer**

We have shown that markets for environmental services rarely develop without some type of outside intervention. Government and other groups can reduce supply and demand impediments through regulation, market design, program coordination, education, verification, certification, and research. One of the features of working markets is the incentive to reduce transaction costs. While transaction costs may be high initially, and require Government assistance to reduce them to get the market started, costs tend to decrease over time as new institutions and mechanisms are developed by those who benefit most from them.

What the ultimate scale of markets for environmental services might be is difficult to say. For fee hunting, which is not a new concept, attitudes of both landowners and hunters may prevent much expansion. Both the water quality trading and wetland case studies indicate that the combination of factors required for markets to develop may be limited to a relatively few areas, given the current regulatory regime. On the other hand, the market for greenhouse gas reductions could be greatly expanded if a national discharge cap is implemented and producers across the country could participate in the global market. Organic agriculture and other labels are relatively new, and increased concerns over the environment could raise demand for foods produced in such a way as to provide environmental services.

Even though government can take a number of actions to promote markets for environmental services, such actions may not always be advisable. The costs of setting up and supporting a market may outweigh the benefits. The uncertainties associated with nonpoint-source pollution from farms may never be overcome sufficiently enough to allow water quality trading markets to develop on a wide scale. Government may have to use alternative approaches, such as regulation or financial incentives, to reduce pollution from nonpoint sources and to improve water quality. Similarly,

difficulties in measuring wetland services that are being lost through development or gained through restoration could relegate mitigation banking to a seldom-used tool and increase the demand for regulation or other approaches for meeting the national goal of no-net loss of wetlands. Free riding will continue to limit demand for foods covered by an eco-label, reducing the economic incentive to expand eco-friendly agriculture. Fee hunting may never become widespread because of long-ingrained attitudes about access to land for hunting.

It is probably safe to say that markets for environmental services will never supplant the need for traditional conservation programs, which will continue to play a major role in providing environmental services. Where markets do develop, government can play a role in advising market managers on the potential tradeoffs between different design and eligibility options, in providing outreach and information to reduce transactions costs and uncertainty for market participants, and in establishing standards and certification that provide consumer confidence in environmental services produced by farmers and ranchers.