

Creating Markets for Environmental Stewardship

Potential Benefits and Problems

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- Farmers and other landowners typically under-provide environmental services such as clean air and water, carbon sequestration, and improved wildlife habitat.
- Markets for environmental services could increase farmer investments in environmental stewardship, thereby expanding the supply of environmental services.
- Impediments to the formation of fully functioning markets for agricultural environmental services may be difficult or costly to overcome.

What does a farm produce? Food and fiber is the obvious answer, but most farms have only a portion of their land in crop production. Farms also contain significant amounts of pasture, forest, ponds, meadows, grasslands, and wetlands. In 2002, farms accounted for 41 percent of all U.S. land, including 395 million acres of pasture and range, 76 million acres of forest and woodland, and 16 million acres of wetlands. This natural capital can provide a host

of environmental services, including cleaner air and water, flood control, improved wildlife habitat, and carbon sequestration.

When farmers decide how to use their land, they generally consider only uses that produce goods and services that can be sold. Products expected to generate the greatest net returns are the ones generally selected for production. As a result, when farmers make their production choices, market com-

modities win out. Since environmental services generally do not have markets, they have little or no value when the farmer makes land-use or production decisions. As a result, environmental services are under-provided by farmers. This is one reason why billions of dollars are spent each year by government and nongovernment organizations to pay farmers to maintain natural areas and improve the environmental performance of their farms.



Lynn Betts, USDA/NRCS

If environmental services could be sold like other commodities, at prices that reflected their true value to society, farmers would likely invest more to maintain wildlife habitat, woodlots, and wetlands. And, those who benefit the most from environmental services would pay for them. This could mean a reduced need for taxpayer-funded investments in environmental services, increased private investments that are more responsive to changing economic and environmental conditions, and, perhaps, less costly service provision. The question remains: If these services are valued by society, why are there no markets for environmental services?

Environmental Services Defy Ownership

The biggest reason that markets for environmental services do not develop naturally is that the services themselves have characteristics that defy ownership. With private goods, such as traditional agricultural commodities, a farmer transfers ownership only when a buyer pays

the desired price. Environmental services do not have this characteristic. Once they are produced, people can “consume” them without paying a price. Improved water quality, for example, benefits everyone downstream, whether or not they pay for it. Most consumers are unwilling to pay for a good that they can obtain for free, so markets cannot develop. Without a market, there are no price signals encouraging farmers to produce environmental services as part of the farms’ output.

Can anything be done other than relying on government programs to provide publicly funded investments in environmental stewardship? While government programs provide incentives to farmers to provide environmental stewardship, they lack many of the desirable characteristics of fully functioning markets. Markets allocate resources efficiently (at least in theory), those who benefit pay, and markets

are flexible in the face of changing conditions. Farmers could also benefit from the additional stream of income earned from their land.

Experiences With Creating Markets for Environmental Services

Creating markets for environmental services is not an entirely novel idea. Several markets (water quality trading, carbon trading, and wetland mitigation) have been created to reduce compliance costs associated with environmental regulations. Two other markets (eco-labeling and fee hunting) have developed on their own. Experiences with these markets highlight their promise and pitfalls.

One important characteristic of most markets for environmental services is that government or some other authority plays a central role in setting them up—they do

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not spontaneously develop from the interaction of buyers and sellers, as most markets do. The reason, as noted, is that environmental services, to varying degrees, defy ownership—they are public goods. One way to get around this is to create a good related to the environmental service that has private-good characteristics, as has been done for markets in water quality trading, carbon trading, and wetland mitigation. These markets would not exist without government programs that require regulated business firms (such as industrial plants and land developers) to meet strict environmental standards. In essence, legally binding caps on emissions (water and carbon) or mandatory replacement of lost habitat (wetland mitigation) create the demand needed to support a market for environmental services.

In the case of water quality, the U.S. Environmental Protection Agency (EPA) has established caps on total pollutant discharges from regulated firms in some watersheds, and issued discharge allowances to each firm specifying how much pollution the firm can legally discharge. A firm can discharge more pollution than its original allocation by purchasing allowances from other firms that have cut their own pollution discharges below EPA allowances or from unregulated sources of pollution, such as agriculture. This transaction is known as a trade. Discharge allowances, therefore, have characteristics of a private good. So-called cap and trade programs create a tradable good related to an environmental service, and use program rules to create demand. Farmers are likely to be able to provide discharge reductions at a lower unit cost than industry can, and to profit from the exchange (see box, "Trading Can Reduce the Cost of Lowering Emissions").

In markets for greenhouse gases, carbon credits are exchanged. Members of the Chicago Climate Exchange that voluntarily commit to reducing their carbon

Trading Can Reduce the Cost of Lowering Emissions

Without trading, the regulated firm reduces discharges by 500 pounds at a cost of \$25,000 (500 lbs at \$50 per pound), and the farm does nothing.

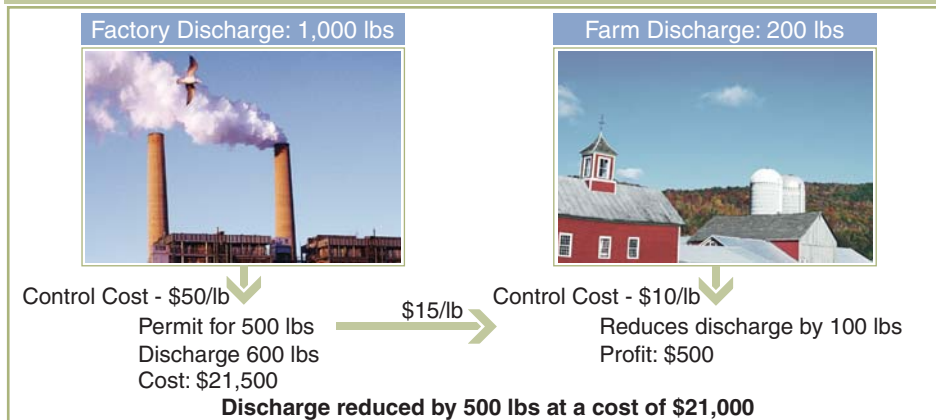
With trading, the firm reduces discharges by 400 pounds at a cost of \$20,000 (400 lbs at \$50 per pound). The farm is willing to reduce discharges for a price of \$15 per pound. The firm purchases 100 pounds of reduction from the farm at a cost of \$1,500 (100 pounds at \$15 per pound). The firm's costs have been reduced to \$21,500 (a savings of \$3,500). The farm reduces discharges by 100 pounds at an actual cost of \$1,000 (100 pounds at \$10 per pound). The farmer receives a payment of \$1,500 from the firm, so actually realizes a profit of \$500 for trading with the firm.

The total cost of reducing pollution (not considering profit to the farmer) has been reduced from \$25,000 to \$21,000.

Example: Firm discharge limit, no trading



Example: Firm discharge limit, with trading



emissions by 17 percent can purchase carbon credits in an offset market. For wetlands, it is mitigation credits. No-net-loss requirements for new housing and commercial development require that lost wetland services be replaced, creating demand for mitigation credits, which are produced by creating new wetlands. In all of these cases, the managing or regulatory entity defines the tradable good and enforces the transactions.

Eco-labeling uses a different approach. Rather than creating a new good, labeling establishes a link between an existing private good (for example, a food product) and an environmental service (wildlife viewing, for example). Eco-labels allow consumers to purchase products, possibly for a higher price, that are produced in an environmentally friendly manner. Dolphin-friendly tuna and organic labeling are examples. The organic label can be used only by farms that agree to follow a specific set of environmentally friendly management practices.

Fee hunting is another example of linking an environmental service with a private good. Wildlife is a public good. However, access to private land to hunt is a private good. Landowners can sell access to their land for hunting. The fee provides an incentive for the farmer to maintain wildlife habitat on the farm (see "Fee Hunting May Boost Farm Income, Wildlife Habitat," on page 7).

Markets Depend on More Than Just the Existence of a Good

Simply creating demand for an environmental service does not guarantee that a market for services from agricultural sources will actually develop and thrive. For example, trades have occurred in only 4 of the 22 water quality trading programs that include agriculture as a source of credits. Only a small percentage of farmers run fee hunting operations, despite a high demand for access to private land for

hunting. Farmers appear to be able to restore wetlands at a lower cost than many other landowners, yet only a handful of the more than 600 current wetland mitigation banks are operated by farmers.

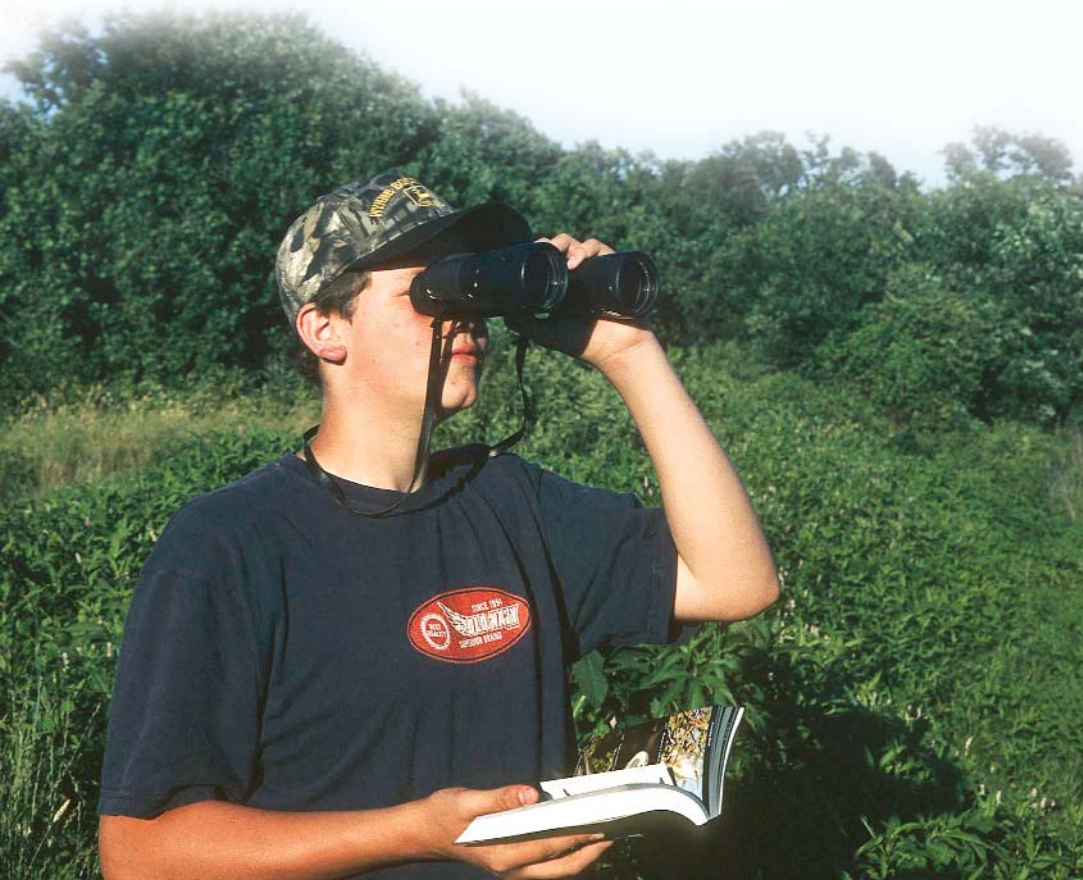
As it turns out, a number of impediments affect agricultural producers' ability to participate in markets for environmen-

tal services. One of the most important is uncertainty over the environmental impact of changes in farming practices. In emissions trading and offset markets, uncertainty about the quantity of credits supplied by agricultural producers reduces demand. Purchasers may be unwilling to enter into a contract with a farmer who

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USDA is supporting the development of tools and methods for quantifying how farming practices affect environmental services.

cannot guarantee delivery of the agreed-upon quantity of pollution abatement, wetlands services, or other environmental service. This unwillingness is especially true if the good is being used to meet a regulatory requirement. Uncertainty can be addressed by regulators' requiring "factors of safety" and other coefficients (referred to as a "trading ratio") to compensate for that uncertainty. However, trading ratios increase the number of credits the buyer must purchase to replace one unit of pollution abatement, thereby increasing costs and reducing demand for credits produced on farms.

Uncertainty about label claims can be a major problem with eco-labels. Consumers have no way of knowing if the agricultural goods they purchase are from producers that actually deliver the environmental services claimed on the label. Eco-labels can only deliver environmental services if consumers believe the label claims are accurate, and producers live up to their claims.

Uncertainty also affects the potential supply of environmental services. A farmer who is uncertain about the economic benefits of investing in environmental stewardship because the quantity

of the resulting environmental services is uncertain is far less likely to make the investment. Some markets prevent uncertain services from being sold. The Chicago Climate Exchange does not certify credits from soil types for which scientific evidence is lacking on the soil's ability to sequester carbon.

Transaction costs can also undermine the development of markets for environmental services. Environmental services from agriculture are produced across a diverse landscape, and unlike food and fiber, they cannot be packaged and shipped to a central market. Just locating trading partners can be costly for individual market participants, particularly if a buyer needs to find and negotiate contracts with multiple farmers in order to accumulate enough credits to meet permit requirements. In addition, providing environmental services is likely to be secondary to a farmer's primary activity of producing agricultural commodities. It may be too costly for farmers to learn about potential demand for an environmental service, meet participation requirements, develop a business plan, keep the necessary records, and integrate the new business into the traditional farming operation.

Fee hunting faces a unique problem—peer pressure. Fee hunting is looked upon unfavorably in many States with a tradition of open access to the land for hunting. Farmers looking to profit from what traditionally had been a simple handshake agreement may be regarded unfavorably by their peers. This may be a reason that fee hunting is not widespread in many parts of the country, even though demand for access is high.

What Can Be Done To Assist Market Development?

If markets are to become important tools for generating resources for conservation on farms, Government or other

organizations may have to help emerging markets overcome uncertainty and transaction costs. One feature of markets is that once they become established, entities will emerge that provide cost-reducing services that benefit the market. For example, private integrators are seeking out greenhouse gas reduction projects, assembling credits, and selling them on the Chicago Climate Exchange.

Government can play a major role in reducing uncertainty by providing research on the level of environmental services from different conservation practices. USDA is supporting the development of tools and methods for quantifying how farming practices affect environmental services. For example, USDA and EPA are developing an online Nitrogen Trading Tool to help farmers determine how many potential nitrogen credits they can generate on their farms for sale in a water quality trading program. Other USDA research programs include Greenhouse Gas Reduction through Agricultural Carbon Enhancement Network (GRACENet) and the Conservation Effects Assessment Project (CEAP).

Government can reduce uncertainty by setting standards for environmental services. USDA is playing an important role in establishing standards for organic agriculture that provide assurance to consumers that the claims on the label are believable. Standards also protect producers from dilution of price premiums due to false claims by those not meeting the organic standards. USDA also supports "market-based stewardship" by cooperating with other Federal agencies and groups to develop accounting practices and procedures for quantifying environmental goods and services in other types of markets (see box, "USDA Activities That Support Environmental Service Markets").

Information from Government and other groups can reduce the costs of market participation. For example, many State

USDA Activities That Support Environmental Service Markets

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

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.

The Food, Conservation and Energy Act of 2008 requires the Secretary of Agriculture to establish technical guidelines for measuring ecosystem services from conservation and other land management activities, with priority given to participation in carbon markets. Guidelines are also to be established for a registry to record and maintain information on measured environmental service benefits, and a process for verifying that a farmer has implemented the conservation or land management activities reported in the registry.



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cooperative extension offices provide information to producers interested in offering fee hunting, with checklists to help identify business goals, the type of lease to offer (such as daily, long-term lease, or lease to a hunt club), other services to offer (such as bed and breakfast, guides, or game cleaning), how to advertise, and how to manage risk.

One way that markets have addressed the issue of bringing all potential parties together is through the establishment of clearinghouses that collect information from buyers and sellers and provide it at little or no cost to potential market participants. Clearinghouses are used in some water quality trading programs. Third-party brokers and aggregators also bring buyers and sellers together by purchasing credits from producers and selling them to


buyers. Both government and private sector entities are playing the aggregator role in water quality, carbon, and wetland mitigation markets. Aggregators also reduce uncertainty by verifying the level of services sold.

Government can help farmers who must meet minimum practice standards before being eligible to participate in offset markets by targeting them for assistance from conservation programs. Government can also encourage fee hunting by offering liability coverage to landowners allowing hunters on their land.

Where farmers can participate in more than one market, stacking credits provides an additional incentive to adopt practices that provide multiple benefits. For example, a producer can install a vegetative buffer at the end of a field to capture the nutrient and sediment runoff. Within this buffer, carbon is also sequestered and wildlife habitat is created. Each of these benefits has value and can be traded if markets exist.

But There Are Limits to Markets

While markets have many desirable properties, they are limited in what they can accomplish, even with government assistance. Public good characteristics that defy ownership discourage markets for environmental services from developing—and prevent the full value of environmental services from being reflected in prices. Even though some consumers may be willing to pay a higher price to support an eco-label, for example, many others who benefit from the resulting environmental services avoid paying for them by purchasing unlabeled goods at lower prices. The prices of credits in water, carbon, and wetland markets also may not reflect their full social value, only their value to the regulated community.

Some markets may eventually become widespread. A national cap-and-trade program, such as that proposed by Congress, could establish a national market for carbon credits and create sufficient demand to entice many farmers to enter. Others, such as water quality trading or wetland mitigation, may be limited to a few specific geographic areas. For example, of more than 700 watersheds impaired by nutrients, less than a third have characteristics that are required to support active markets for discharge credits from farms. The bottom line is that markets for environmental services are not likely to supplant the need for traditional conservation programs, which will continue to play a major role in providing environmental services. But where they can become economically viable, they can provide an important vehicle for encouraging investment in environmental stewardship. 



This article is drawn from . . .

The Use of Markets To Increase Private Investment in Environmental Stewardship, by Marc Ribaud, LeRoy Hansen, Daniel Hellerstein, and Catherine Greene, ERR-64, USDA, Economic Research Service, September 2008, available at www.ers.usda.gov/publications/err64

You also may be interested in . . .

Environmental Credit Trading: Can Farming Benefit? by Marc Ribaud, Robert Johansson, and Carol Jones, in *Amber Waves*, Vol. 4, Special Issue, USDA, Economic Research Service, July 2006, available at www.ers.usda.gov/AmberWaves/July06SpecialIssue/Features/Trading.htm