

Market Basics

Markets are institutions through which potential buyers and sellers of goods and services deal with each other in the process of exchange. In a perfect world of competitive markets, resources move to their highest valued use (see box, “Value of Markets”). With market failure—that is, when markets do not operate properly—resources are not allocated to their highest valued use. Addressing market failure is one of the roles of government.

Markets for Environmental Services

Few well-functioning markets have developed for environmental services, even though evidence is strong that consumers are willing to pay for them (see chapter 2). The lack of markets has important consequences in the allocation of resources on farms. Without well-defined markets for environmental services, landowners are not rewarded financially for supplying them. For example, without a market for environmental services, a farmer with native vegetation on his or her land has no economic incentive to preserve the cover and the environmental services it provides. The farmer’s land-use decision will be based on the potential return from agricultural commodities. If the value that society places on environmental services could be captured by the farmer, he or she would more likely keep a larger fraction of his or her land in a natural state.

Keep in mind that agricultural producers’ motivations are more complex than simply profit maximization. Most agricultural producers value environmental services and may sacrifice some potential income to enjoy them on their farms. Without markets, however, agricultural producers’ provision of environmental services is based on their own personal preferences, rather than the value society places on them. The result is likely to be an underprovision of those services.

Why Do Markets Fail?

Before exploring how markets for environmental services might be created, it is important to understand why markets fail. Markets for environmental services rarely exist because one or more of the following factors apply (Murtough, Aretino, and Matysek, 2002; Ruhl, Kraft, and Lant, 2007):

- Public good characteristics.
- Market burdens, such as large transaction costs and uncertainty.
- Institutional barriers.

Public Goods

Because environmental services are the product of complex ecosystem processes and delivered through a variety of landscape settings, they nearly always take on characteristics of public goods; they are nonexcludable and nonrival. With a private good, a producer can prevent someone who has not

Value of Markets

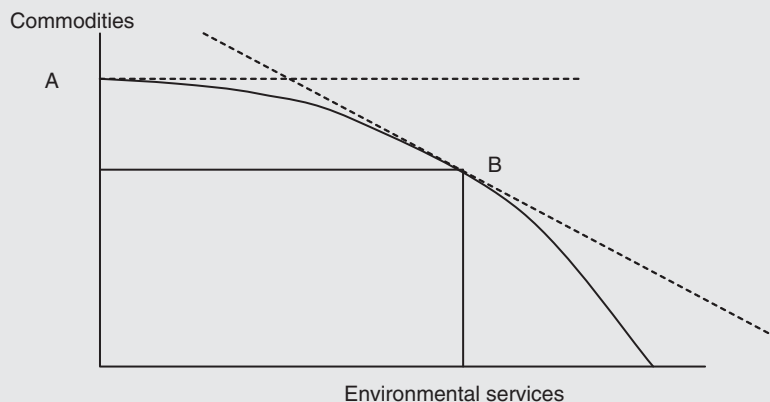
Markets are driven by individuals and firms striving to maximize their own well-being. Relative prices determined by the interaction of supply and demand satisfy the necessary conditions for maximizing social welfare. The producer combines price information from product markets with price information from input markets to determine how much to produce and how many inputs to purchase. The market supply curve for the product represents the production decisions made by all producers over a range of prices. The consumer participates in various product markets based on prices, income, and personal preferences. The market demand curve for a product represents the purchasing decisions made by all consumers over a range of prices.

If the market functions properly, factors of production move to those uses where they earn the highest return; resources are used most efficiently, and both producers and consumers enjoy maximum benefits from production and consumption.

Prices in a perfectly operating market tell participants how valuable one good or input is relative to another, making them the most important piece of information driving decisions about production and consumption. However, markets rarely operate perfectly. Various factors can affect the interplay of supply and demand so that prices no longer convey the true values of goods and services. A market for a good may also fail to form entirely. Under these conditions, factors of production do not move to those uses where they have the greatest value; resources are misallocated, and overall social welfare is lower than if markets operated perfectly.

The figure depicts the production possibility frontier (PPF) for a farm, or the marginal tradeoff between production of a commodity and an environmental service. The shape of the curve is a function of the farm's resource base and technology set and the farmer's management skills. The mix of commodities and environmental services provided by the farmer depends on the prices received for each. If no market exists for the environmental services and only the commodity has a price, then the farmer maximizes income by producing at point A; no environmental services are produced. Alternatively, if a market for environmental services could be created, then a price for that service would exist. The farmer would maximize net returns by producing at a point such as B, where the slope of the PPF equals the ratio of prices. Fewer commodities and more environmental services are produced.

Tradeoff between production of commodities and environmental services on a farm



paid for it from obtaining it; it is excludable. For a public good, a provider cannot exclude someone who has not paid a price from obtaining it. For example, a farmer contemplating the sale of improved water quality by establishing vegetative buffers on his or her farm cannot exclude downstream users from benefiting; the downstream users are “free riders.” In this situation, the farmer does not have an economic incentive to provide the good.

Furthermore, when a good is nonrival—that is, exclusive ownership is not possible—a buyer’s purchase of a good will also benefit other individuals. Thus, the value to society of the good (say, improved water quality) is the sum of everyone’s enjoyment. However, when individuals consider how much they will pay, they will not consider this sum; instead, they consider only their own personal values. Thus, even if a willing seller existed, the net price the producer could receive would be too low; it would reflect one individual’s value rather than the sum of the values of all individuals.

The point is that prices tell market participants how valuable one good or input is relative to another, making prices the most important piece of information driving decisions about production and consumption. If prices for environmental services under-represent their true value, fewer resources will be directed toward the production of environmental services than is socially optimal. The public-good nature of most environmental services is the primary reason that markets for them do not develop. Consequently, the price for most environmental services is zero.

Transaction Costs

Transaction costs are the costs of doing business. Parties must find one another and exchange information. They may also have to inspect or measure the good, draw up contracts, and consult with lawyers or regulators (Stavins, 1995). These actions require inputs of time or resources, costs that reduce the overall benefits expected from the transactions. If transaction costs are high relative to the value of the good, then exchange may have no benefits and a market could fail to develop.

Transaction costs associated with potential markets for environmental services are likely to be high. One issue with environmental services from agriculture is that they are often secondary to a farmer’s primary activity of producing agricultural commodities; they are produced as externalities of agricultural production. It may be too costly for a farmer to learn about potential demand for an environmental service, develop a business plan, keep the necessary records, and integrate the new business into the traditional farming operations.

Environmental services, such as water quality and carbon sequestration, are difficult to measure. The monitoring necessary to measure these services is often expensive and may require intrusive visits to the farm.

Traditional farm commodities already have established systems for collection and distribution. Farm commodities are generally homogeneous, prices are established in centralized markets, and agricultural producers do not have to negotiate with each potential final buyer. On the other hand, environmental services tend to be unique for each farm, with no standard form of transac-

tion. A farmer wishing to sell an environmental service may have to negotiate with each potential buyer, a potentially costly process. The same would be true for a buyer of environmental services, who may have to negotiate with many farmers.

Uncertainty

The performance of conservation practices in the production of environmental services is one of the most important sources of uncertainty in environmental markets. Uncertainty about the quantity and quality of services a farmer can produce affects both the demand and supply side of markets. Markets function best when information on the commodity is complete and readily available to all potential market participants. Environmental services, however, are often difficult to observe, such as the nutrient-filtering capacity of wetlands or the sequestration of greenhouse gases from adopting conservation tillage. Determining the quantity of services a farm can produce is, therefore, often left to estimation, based on farming practices and location. When information is missing, or otherwise inaccessible, potential customers may be reluctant to enter the market, or they may trade less. Uncertainty can also affect producers. Agricultural producers are reluctant to adopt management practices if potential returns are uncertain. Not knowing the quantity of environmental services that can be produced and sold would be a major impediment to entering a market for environmental services. Determining the amount and nature of the services a farm can produce can be costly, especially given their complex nature.

Institutional Barriers

Institutional barriers may prevent agricultural producers from selling an environmental service in existing markets. Agricultural producers may be unable to sell environmental services either by rule or because the rules that govern participation limit the supply of services a farm can provide in a market. For example, participants in the Wetlands Reserve Program are prohibited from selling some environmental services created by wetland restoration paid for by taxpayers, including carbon sequestration, open space, and wetland services (for the purposes of mitigation) (USDA, Natural Resources Conservation Service, 2007a).

Some markets do not allow environmental services from agricultural sources because of a high level of uncertainty about the amount actually produced or about their long-term supply. For example, some markets for greenhouse gas reduction do not allow credits from sequestration in agricultural soils because of the risk of future carbon emissions due to changes in management (known as the permanence issue) (Ecosystem Marketplace, 2007a). One could argue that uncertainty would reduce the demand for such credits in a market anyway and be reflected in price, but some markets have chosen to take away the choice entirely.

Some water quality trading programs require agricultural producers who wish to sell credits to be practicing a minimum level of stewardship. Requiring a minimum level of stewardship to participate in the trading program prevents the lowest cost credits from being marketed, raising the overall price of credits for point sources. The requirement is also a barrier

for some producers, discouraging them from entering the market. A producer may be unwilling to bear the cost of achieving the minimum level of stewardship before being eligible to sell credits.

While not necessarily a barrier, government programs can sometimes compete for producers' investment in environmental stewardship. Government conservation programs and markets for environmental services sometimes have common objectives and outcomes. For example, conservation programs and trading programs may compete with each other for pollution reductions from agriculture. If a farmer enrolls in a conservation program to reduce nitrogen runoff, the marginal cost of making additional environmental gains (beyond those funded by the conservation program) is higher. If the farmer then wishes to participate in a trading program, the cost of abatement credits is higher than it would have been otherwise. Agricultural producers with a history of heavy involvement in conservation programs may have a more difficult time competing in a market than if they had not been as involved. While the environmental service is still being provided, market forces are not guiding the allocation of resources.

Summary

The public-goods nature of environmental services is the most important reason that markets for environmental services have not developed on their own. Transaction costs, uncertainty, and institutional barriers are also factors inhibiting markets. Government can use a variety of policy tools, including market mechanisms, to create incentives for farms to provide environmental services. The following chapter presents some examples of how market mechanisms have been used to spur the provision of environmental services, as well as steps government can take to promote the creation of sustainable markets.