

Multifunctionality, Agricultural Policy, and Environmental Policy

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In addition to supplying food and fiber, agriculture is a source of public goods and externalities. This article addresses two questions. First, do price and income support policies promote a multifunctional agriculture in an effective manner? Second, would policies targeted more directly at multifunctional attributes be more efficient than price and income support policies? The answer to the first question is no, at least for policies targeted at outputs (price supports, export subsidies, etc.). Public goods are not directly linked to production, but rather to land use and agricultural structures. Evidence in response to the second question is sketchier with respect to policies targeted at land.

Key Words: agricultural policy, environment, jointness, landscape amenities, multifunctionality, trade, transaction costs

The primary function of agriculture is to supply food, fiber, and industrial products. However, agriculture can also be a source of several public goods and externalities. Rural and urban populations often value agricultural land as open space and as a source of countryside amenities. Agricultural land is frequently a habitat for wildlife species. The agricultural sector can contribute to the economic viability of many rural areas and to food security. On the other hand, conversion of forest and wetlands to agricultural production can damage ecosystems. Agricultural nutrients, pesticides, pathogens, salts, and eroded soils are leading causes of water quality problems in many countries. Water used for irrigation in agriculture is water unavailable to nonagricultural sectors or ecosystems. There is concern about the negative effects of livestock production on animal welfare. On either the positive or negative side, agriculture can be both a sink and a source for greenhouse gases.

The term *multifunctionality* refers to the fact that an activity can have multiple outputs and therefore may contribute to several objectives at once. As applied to agriculture, the term first came into use in the late 1990s in the European Union for, it is often argued, protectionist reasons (Bohman et al., 1999; Swinbank, 2001). Some governments have attempted to justify agricultural price and income support programs and trade restrictions as a means of preserving the multifunctional attributes of their countries' agriculture. This has led to friction among member governments at the World Trade Organization (WTO) negotiations and in the Organization for Economic Cooperation and Development (OECD). However, the attention given to multifunctionality has also opened up a research agenda for agricultural and resource economists (OECD, 2001a; Batie, 2003), and provided a new outlet for existing lines of research on topics such as countryside amenities, agricultural land preservation, and rural economic development.

This paper is motivated by two questions. First, do agricultural price and income support policies promote a multifunctional agriculture in an effective manner? Second, would policies targeted more directly at multifunctional attributes be more efficient than traditional price and income support policies?

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Toward this end, the current state of the literature is assessed on two topics: (a) jointness between agricultural commodity production and production of multifunctional attributes, and (b) transaction costs in agricultural and environmental policy design and administration.

Multifunctional Attributes of Agriculture

Agriculture globally is a source of a number of public goods and externalities (Abler, 2001a, b; Shortle, Abler, and Ribaud, 2001; OECD, 2001a, b; Blandford, Boisvert, and Fulponi, 2003). Table 1 provides a listing of public goods that have been often mentioned as multifunctional attributes of agriculture, along with several negative externalities identified in the literature.

Agriculture is a major user of land in most countries, and rural landscapes are often defined by agricultural structures, cropping patterns, the presence of livestock, and the presence of wildlife in agricultural areas. Related to landscape amenities are open-space amenities. Farmland, forests, wetlands, parks, wildlife refuges, golf courses, undeveloped vacant lots, and even cemeteries fall into the general category of open space. There has been concern in many countries about conversion of agricultural land to urban uses and agricultural land abandonment, and how the loss of agricultural land might change the character of rural landscapes.

Landscape and open-space amenities are perhaps the most frequently mentioned multifunctional attributes for agriculture. These terms are sometimes used in a broad sense to encompass several of the other public goods listed in table 1 (e.g., Hellerstein et al., 2002). As used here, they refer in the narrower sense to the aesthetic value of scenic vistas and the enjoyment or tranquility derived from using or being near open areas. They include utility derived from recreational activities in open areas (hunting, fishing, camping, swimming, hiking, bird watching, etc.), which are public goods insofar as these activities are not subject to exclusion or congestion effects. There may also be beneficial externalities that do not rise to the level of a pure public good—for example, open space may increase property values on adjacent parcels of land (Geoghegan, Lynch, and Bucholtz, 2003).

With respect to cultural heritage, farmers and others in rural areas are often viewed as preservers of cultural values which have been lost in urban areas. For many people, agriculture also provides a link to the past when their ancestors lived on farms.

Table 1. Public Goods and Negative Externalities from Agriculture

Public Goods	Negative Externalities
Landscape & open-space amenities	Eutrophication
Cultural heritage	Sedimentation & turbidity
Rural economic viability	Drinking water contamination
Domestic food security	Odors from livestock operations
Prevention of natural hazards	Animal welfare
Groundwater resource recharge	Irrigation—overuse, salinization
Preservation of biodiversity	Loss of biodiversity
Greenhouse gas sinks	Greenhouse gas emissions

As George (1997) cautions, public opinions about farming tend to be nostalgic and do not reflect the reality in rural areas today. Technological, economic, and social changes have had profound impacts in both urban and rural areas. Nevertheless, the preservation of cultural heritage is often cited as one multifunctional attribute of agriculture.

The economic viability of rural areas is a concern in most developed countries. Rapid technological progress in agriculture over the last century has made it possible for a small percentage of the labor force to produce ample food supplies at prices that are significantly lower, in inflation-adjusted terms, than they were 50 or 100 years ago. Rural populations in many regions of the United States and other countries have fallen significantly in recent decades. However, whether the economic viability of rural areas is in fact a public good is open to debate. The question is essentially whether rural areas have an economic value above and beyond their value added in the goods and services they produce.

One economic argument sometimes made is that market distortions can cause the social opportunity cost of labor in rural areas to be lower than market wage rates, and therefore calculations of the economic contribution of rural areas based on market wages understate that contribution. As Horbulyk (2001) emphasizes, however, economists view employment as a social cost, not a social benefit. From an economic perspective, employment gives rise to social benefits only in proportion to the value of goods and services produced by workers.

Food security is often defined as regular access (either through production or purchasing power) to enough food for a healthy and productive life. Yet, when used in the context of multifunctionality, food security has usually been defined in terms of national security, i.e., access to a sufficient amount of food in national or international crises. The argument is that domestic food production can help

ensure against disruptions in imports caused by war, blockades, or other international events.

In terms of natural hazards prevention, irrigated rice production in Japan and South Korea is sometimes cited as a form of flood prevention, because irrigated paddy fields can store water during the rainy season. In this respect, irrigated paddy fields serve one of the functions often ascribed to wetlands. In mountainous countries, agricultural vegetation on hillsides and alpine pastures is sometimes mentioned as a form of protection against landslides and avalanches. With respect to groundwater resources, seepage from irrigation systems has been cited as a mechanism for groundwater resource recharge. On the other hand, irrigation in many areas suffers from overuse of scarce water, salinization, and waterlogging.

Agricultural production can have profound impacts on biodiversity, both for better and for worse (van Dijk, 2001). Agriculture replaces a natural ecosystem—which might be a forest, prairie, desert, wetlands, coastal area, or some other system, depending on the location—with a human-managed ecosystem. Species of flora and fauna having a comparative advantage under the natural ecosystem will decline or become extinct in that area, while species having a comparative advantage under the human-managed ecosystem will prosper. Similarly, agriculture can be both a sink and a source for greenhouse gases (Intergovernmental Panel on Climate Change, 2001).

Other negative externalities from agricultural production include eutrophication of surface waters from excess nutrients in fertilizers and animal wastes, sedimentation and turbidity in surface waters due to soil erosion, drinking water contamination from pesticides, fertilizers, and animal wastes, odors from livestock, and—to many people—problems of animal welfare, particularly in intensive livestock operations (Shortle, Abler, and Ribaud, 2001; Blandford, Boisvert, and Fulponi, 2003).

In any analysis of agricultural/environmental policy and multifunctionality, it is essential to consider not only public goods and beneficial externalities associated with agriculture, but also negative externalities. Some proponents of multifunctionality have emphasized only public goods and beneficial externalities while downplaying negative externalities (Abler, 2001b). Failure to consider both positive and negative external effects can lead to erroneous policy conclusions. Policies adopted to promote public goods could worsen, or at least fail to improve, negative externalities. Peterson, Boisvert,

and de Gorter (2002) illustrate this point using a simulation model with two externalities (landscape amenities, human health costs from agricultural chemicals) and two policies (land subsidy/tax, chemical tax).

The Question of Jointness

The most important issue on the production side of multifunctionality concerns the nature and degree of jointness between the production of crop and livestock products, on the one hand, and production of multifunctional attributes on the other hand (OECD, 2001a). If there were no jointness, multifunctional attributes could be provided independently of agricultural commodities and there would be no case for agricultural price and income support programs as a mechanism for promoting multifunctionality.

In general, jointness can arise due to either technical interdependencies in production or economic interdependencies (OECD, 2001a; Burrell, 2001). Technical interdependencies refer to inherent features of the production process governed by biological, chemical, and physical relationships. Economic interdependencies refer to linkages created by non-allocable inputs or linkages created by allocable fixed or quasi-fixed inputs.

A nonallocable input contributes to multiple outputs simultaneously, so that it is nonrival for one output when used to produce another. If a nonallocable input is used in the production of an agricultural commodity and also in the production of a public good, a change in the commodity output will lead to a change in the nonallocable input, and in turn the supply of the public good. An allocable fixed or quasi-fixed input is available to a producer in a fixed amount or along an upward-sloping supply curve, whereby a change in one output leads to a change in the amount of the input allocated to that output, and in turn the amount of the input remaining for other outputs. If different commodities are associated with different levels of public goods, then reallocation of fixed or quasi-fixed inputs among these products will alter the supply of public goods from agriculture.

The case for technical interdependencies in agriculture is strongest for negative externalities. Problems such as soil erosion, nutrient runoff and leaching, and methane from livestock manure are all governed by biophysical processes, although they can be mitigated using alternative production or abatement technologies.

The case for technical interdependencies for the public goods listed in table 1 is much weaker. One could argue that flood prevention and groundwater resource recharge are inherent features of irrigated agricultural production, at least in some areas. However, technical linkages with production could be weakened or broken because they depend on cropland being irrigated and not on the amount of a crop harvested, or even (within the class of irrigated crops) on the choice of crop itself. Replacing agricultural land with wetlands would also be an option for flood control.

Similarly, landscape and open-space amenities are not related to commodity production per se, but rather to land use practices and agricultural structures (Abler, 2001b). Agricultural structures that are important vary by location and include barns, stonewalls, hedges, roads, ponds, irrigation canals, and watercourses surrounding agricultural fields to capture runoff. It would be possible to conserve traditional agricultural structures—which often serve to remind people of agriculture—even if they no longer have any agricultural value. Within a given area, a broad mix of agricultural land uses and other types of open space appears to generate more amenities compared to a single land use (Kline and Wichelns, 1998).

The case for economic interdependencies for the public goods in table 1 is stronger. In the production of landscape and open-space amenities, agricultural land and structures are essentially nonallocable inputs that contribute to commodity production and can also contribute to these public goods. By the same token, agricultural land can simultaneously contribute to commodity production and the prevention of natural hazards, though as noted above, this is not a case of technical interdependence. Agricultural land, traditional structures, and farm household labor may also contribute to the preservation of cultural heritage. Of course, among comparisons of one agricultural commodity versus another, farm household labor, land, and structures are usually allocable and generally behave like fixed or quasi-fixed inputs.

Jointness between public goods and agricultural land and structures does not necessarily imply jointness between public goods and agricultural output. Econometric evidence reveals the elasticity of supply of land to agriculture as a whole is very low, and elasticities of supply to individual crops and livestock products are also relatively low (Abler, 2001c; Salhofer, 2001). At the same time, elasticities of substitution between land and purchased inputs,

particularly fertilizer, are relatively high (Abler, 2001c; Salhofer, 2001). The result is that changes in agricultural output are accomplished primarily through changes in purchased inputs rather than changes in land. Indeed, agricultural output has grown in virtually all states in the U.S. since 1960, and grown substantially in many states, despite a decline in agricultural land in every single state (Ball, Butault, and Nehring, 2001).

Structural changes in agriculture in recent years appear to have reduced landscape and open-space amenities generated by agriculture. Growth in intensive livestock operations has led to concerns in many communities about surface water and groundwater pollution from animal wastes, as well as odors, especially from hog operations (McBride and Key, 2003; National Research Council, 2003). A 1998 survey of farmers in urbanizing areas of Pennsylvania, conducted by Larson, Findeis, and Smith (2001), found 44% had received complaints in the past few years about agricultural practices, particularly odors. A 2001 U.S. nationwide survey by Esseks and Kraft (2002) found significant support for farmland protection among urban and suburban respondents, but also significant concern among these respondents about contamination of drinking water from pesticides and livestock manure. These findings suggest landscape and open-space amenities in urban and suburban areas are reduced by the presence of nearby intensive livestock operations.

One question that arises with regard to agricultural price and income support programs is whether land would remain in agriculture following a decrease in production of agricultural commodities or a decrease in commodity prices. A study of farmland conversion in the Mid-Atlantic region by Lynch and Carpenter (2003) yielded inconsistent results for 1978–1997 on the role of farm prices and costs in farmland conversion. Population density had a positive and significant impact on conversion. Hardie, Narayan, and Gardner (2001) found farmland prices in the Mid-Atlantic region were determined primarily by nonfarm factors such as average household income and population density, rather than farm-related factors such as net farm returns.

In the European Union, there are concerns that significant cuts in agricultural price supports could lead to widespread agricultural land abandonment or conversion to urban uses (Burrell, 2001; Dobbs and Pretty, 2001). The presumption would appear to be that while the elasticity of supply of land to agriculture is currently low, the land supply curve

has a more elastic portion which would become evident as cuts in agricultural prices shifted the demand for land inward. The experiment has not been run, so we do not know whether this presumption is correct.

Following a sudden and near-complete end to agricultural subsidies in the 1980s, New Zealand experienced only a slight decline in agricultural land as marginal lands were converted to forestry or reverted to native bush, and a diversification of commodities produced on agricultural land (Federated Farmers of New Zealand, 2002). The degree to which the New Zealand experience is relevant to the European Union or United States is unknown.

Proponents of food security as a multifunctional attribute assert that agricultural production is linked to food security because current production helps ensure the availability of a sufficient quantity of land for domestic production should a crisis disrupt imports (Abler, 2001b). However, the same events likely to impair access to imported food would probably also impair access to imported agricultural inputs used in domestic production (OECD, 2001a). Critical inputs largely imported by many countries include fertilizers, pesticides, seeds, oil, machinery, machinery parts, and livestock feed.

In addition, food security does not necessarily imply a continuation of current land usage patterns. Allowing for cutbacks in food consumption toward survival levels and substitution among foods produced and consumed could significantly reduce land usage below current levels (Brunstad, Gaasland, and Vårdal, 2001). Public stockholding of agricultural commodities is also an option for ensuring the availability of food during a crisis (OECD, 2001a).

Among the public goods listed in table 1, the case for economic interdependencies with agricultural production is weakest for rural economic viability. Agriculture in developed countries represents only a small percentage of the rural economy, and is becoming smaller. Farms currently account for only 5% of the rural U.S. population (U.S. Census Bureau, 2002), and farm income accounts for only 4% of total personal income in nonmetropolitan U.S. counties (Kassel and Carlin, 2000). The rural nonfarm share of the U.S. population has been relatively constant since 1900 in spite of a major decrease in farming's share of the U.S. population (Gale, 2000).

If agriculture had been a linchpin of the rural economy, the rural nonfarm share of the population should have declined as a result of decline in the farm share of the population. Even in the short run,

adverse conditions in agriculture need not threaten the economic health of rural areas, provided other conditions are favorable. For example, the unemployment rate in rural areas of the United States declined substantially in the second half of the 1990s, as rural areas joined in the U.S. economic boom. This occurred even as agricultural prices were falling significantly (Gale, 2000). Agriculture's contribution to the economic viability of rural areas in the European Union is also small (Hofreither, 2002).

Policy-Related Transaction Costs and Multifunctionality

Transaction costs have been defined broadly as "the economic equivalent of friction in physical systems" (Williamson, 1985). Within this broad definition, transaction costs include all costs of acquiring information, making decisions, reaching agreements, and administering agreements once reached. Although transaction costs have usually been applied to private decision making, they are increasingly being applied to governmental decisions (e.g., Carpentier, Bosch, and Batie, 1998; Falconer, Dupraz, and Whitby, 2001; Falconer and Whitby, 1999; McCann and Easter, 2000; Vatn, 2002).

OECD (2001c) gives the transaction costs example of a targeted direct payment to farmers, in which case there are costs to the government of designing the policy, obtaining legislative and executive approval, establishing selection criteria for which farmers will receive payments, establishing criteria for what farmers must do to obtain payments, determining payment levels, disbursing payments, monitoring and auditing payments, and evaluating policy outcomes. To these transaction costs should be added the costs to farmers of learning about the policy, deciding whether to apply for payments, the application process, depositing payments, and complying with audits and other reporting requirements. When disputes arise, there may also be costs of arbitration or litigation that should be counted as part of transaction costs.

Policy-related transaction costs are important to multifunctionality for two reasons. First, it may be possible to economize on transaction costs by using one policy instrument to achieve multiple objectives. Tinbergen's (1952) well-known maxim—*at least as many policy instruments are required as there are policy objectives*—need not hold in a world with policy-related transaction costs. Agriculture has a wide variety of multifunctional attributes and

it may or may not be efficient to have a separate policy for each of them.

Second, different policy instruments can carry different transaction costs. As argued by Vatn (2002), the transaction costs of targeted agri-environmental policies may be so high that agricultural price and income support policies, including policies which restrict international trade, may be the most efficient option for promoting multifunctional attributes. In contrast, in a model with no transaction costs, trade barriers never lead to a social optimum, even in the presence of multifunctionality (Paarlberg, Bredahl, and Lee, 2002).

Estimates of administrative costs for agricultural programs suggest significant differences across programs. Administrative costs are available from public budgets; estimates of other types of transaction costs are more difficult to derive and tend to be rare. Traditional price and income support programs carry administrative costs generally ranging between 1% and 5% of total program costs to the government (Falconer and Whitby, 1999; Vatn, 2002). By contrast, administrative costs for agri-environmental programs in the United States and Europe range from about 5% of total government costs to nearly 50% (Falconer, Dupraz, and Whitby, 2001; Falconer and Whitby, 1999; McCann and Easter, 2000; Vatn, 2002). It is relatively easy to transfer funds to farmers based on acreage or production, but more difficult to ensure that environmental or land management conditions are followed in return (Falconer and Whitby, 1999).

In the United States, agri-environmental programs include the Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), Environmental Quality Incentive Program (EQIP), conservation compliance requirements for farm commodity programs, and federal, state, and local farmland preservation programs (Ribaudo, 2001; Hellerstein et al., 2002).

In the European Union, there are hundreds of agri-environmental programs at various levels of government. These programs are usually voluntary and generally compensate farmers for following certain management practices (Gatto and Merlo, 1999; Hanley, 2001). The majority of these programs have more than one objective, with the most frequently occurring objectives being reduction of negative externalities from agriculture, wildlife conservation, and landscape conservation (Gatto and Merlo, 1999).

One reason why agri-environmental programs carry relatively high administrative costs may be

that most of these programs have been relatively small in scale to date, covering fewer farms than the number covered by price and income support programs. Consequently, fixed administrative costs for agri-environmental programs (costs independent of the number of farms covered) are relatively large when expressed on a per farm basis.

In their study of administrative costs for Environmentally Sensitive Areas (ESAs) in the United Kingdom, Falconer, Dupraz, and Whitby (2001) found economies of scale with respect to the number of agreements made with farmers in any one ESA. They also observed significant learning-by-doing effects, with administrative costs falling as the number of years of experience in managing agreements increased.

Targeted agri-environmental programs can have the advantage of incurring transaction costs for only those farms where public goods or negative externalities are most important. There is significant spatial variability in agricultural landscapes, the economic contribution of agriculture to rural areas, natural hazards, biodiversity, and nonpoint agricultural pollution (Abler, 2001b). Agricultural price and income support programs incur transaction costs for all farms producing commodities covered by the programs, regardless of whether or not they are located in areas where multifunctional attributes are important.

Based on the findings of Carpentier, Bosch, and Batie (1998), targeting nitrogen runoff performance standards toward farms most responsible for runoff would increase transaction costs per farm covered under the standards, but would reduce total transaction costs because fewer farms would be covered. Their findings also suggest targeting would reduce total program costs (transaction costs plus compliance costs).

Related to the above discussion is the potential for geographic mismatches between farm program benefits and multifunctional attributes. U.S. farm program benefits are geographically concentrated in the Corn Belt and Great Plains (Gunderson et al., 2000). In the Mid-Atlantic and Northeast, where there are significant concerns about loss of agricultural land to housing and urban uses, farm program benefits are comparatively small. Similar geographic mismatches occur in the European Union (Hofreither, 2002; Potter, 2002).

The transaction cost issue is mainly applicable to public goods positively associated with land, structures, or other agricultural inputs. For dealing with negative externalities, there are unlikely to be

any transaction cost savings with price and income support programs because these programs generally worsen negative externalities. Price and income support programs have been widely identified as a contributor to nonpoint agricultural pollution through effects on the scale of production, input usage, and farm structure (Shortle, Abler, and Ribaud, 2001; OECD, 1998).

These programs tend to encourage farmers to produce on environmentally sensitive lands and make more intensive use of environmentally harmful inputs (fertilizers, pesticides, irrigation water, and fossil fuels). Agricultural policies designed to increase livestock production also imply an increase in livestock wastes. One might think that supply controls such as production quotas or acreage restrictions would be environmentally beneficial because they reduce output, but this is not necessarily the case. Acreage restrictions may lead to substitution of environmentally harmful inputs such as fertilizers and pesticides for land. The rents created by output quotas and acreage restrictions may encourage resources to remain in agriculture which would otherwise exit.

Conclusions

As noted in the introduction, this paper was motivated by two questions. First, do agricultural price and income support policies promote a multifunctional agriculture in an effective manner? Second, would policies targeted more directly at multifunctional attributes be more efficient than traditional price and income support policies?

The answer to the first question appears to be "No," at least for agricultural policies targeted at outputs (price supports, output subsidies, export subsidies, import restrictions). Available evidence on jointness indicates public goods associated with agriculture are not joint with commodity production *per se*, but rather with land use practices, agricultural structures, and perhaps farm household labor. The elasticity of supply of land to agriculture is currently low, with the result that changes in agricultural commodity outputs are accomplished primarily through changes in purchased inputs rather than changes in land. On the other hand, negative externalities associated with agriculture are joint with production to at least some degree. Negative externalities have worsened significantly in several countries in recent decades as the intensity of agricultural production has increased (OECD, 2001b). Further research is needed to examine how

the supply of land to agriculture might respond to the large decreases in output prices which elimination of farm price and income support policies in many countries would entail.

Available evidence in response to the second question is sketchier. Agricultural price and income support programs in developed countries carry high consumer and taxpayer costs (OECD, 2002), and encourage socially costly negative externalities (Shortle, Abler, and Ribaud, 2001; OECD, 1998). However, they may economize on policy-related transaction costs compared to more complicated agri-environmental policies. It is relatively easy to transfer funds to farmers based on acreage or production, but more difficult to ensure that environmental or land management conditions are followed in return.

Clearly, the topics addressed here provide fertile ground for future research. For example, extended research needs to focus on (a) estimating policy-related transaction costs, especially types of transaction costs other than administrative costs; (b) determining whether policy-related transaction costs for agri-environmental programs could be reduced through selective targeting of farms subject to the programs; and (c) assessing whether any savings in transaction costs achieved by using agricultural price and income support programs would be sufficient to outweigh the social costs of these programs due to market distortions and negative externalities.

Agricultural policies targeted at land are a somewhat different case than policies targeted at commodity outputs. Payments based on land area encourage the supply of agricultural land and perhaps the supply of public goods associated with land, albeit to a limited degree because the elasticity of supply of agricultural land is low. A useful area of future research would be an examination of how the supply of public goods associated with agricultural land responds to payments based on land area. Land payments can also encourage extensification of agriculture in which land is substituted for environmentally harmful inputs (fertilizers, pesticides, irrigation water).

Compared to other forms of agricultural price and income support, payments based on land area carry lower social costs and lead to fewer distortions in international trade (Dewbre, Antón, and Thompson, 2001). Payments requiring the planting of specific crops are more inefficient and trade distorting than payments made irrespective of which crops are grown, but these differences are small

compared to the differences between land payments and other forms of agricultural support (Dewbre, Antón, and Thompson, 2001).

One important topic not addressed here is the valuation of public goods provided by a multifunctional agriculture. This is a major research challenge, and the penalties for getting it wrong—underprovision of public goods if valuations are too low, or distortions in domestic and international agricultural markets if valuations are too high—could be significant (Randall, 2002; Lima e Santos, 2001).

Another important topic touched upon only briefly in this article relates to possibilities for nonagricultural provision of public goods—for example, nonagricultural options for flood control, scenic landscapes, or rural economic development (OECD, 2001a; Meister, 2001). One research question here is whether agricultural or nonagricultural provision is more efficient, which hinges on the existence and magnitude of economies of scope between agricultural commodity outputs and public goods. Another research question is whether some public goods could be converted into private goods through changes in property rights, encouraging the creation of markets for these goods.

It seems clear that multifunctionality as the term has been used by some of its proponents, in essence as a euphemism for protectionism, is not a viable concept. However, as an organizing principle for thinking about agriculture's role in modern societies, it can serve as a stimulus for research on the nature and value of public goods and negative externalities generated by agriculture, and for research on public policies designed to best ensure provision of public goods and minimization of negative externalities.

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