

Farmland Protection: The Role of Public Preferences for Rural Amenities.

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Abstract

Public amenities provided by a rural agricultural landscape, arising from open space and farm activity, are important to many citizens and policymakers. Widespread development of farmland in some parts of the country has spawned an expanding array of farmland protection programs by county, State, and Federal governments, as well as by nonprofit organizations. To investigate the relative importance of preserving different amenities, this report examines the enabling legislation of these programs across the 48 contiguous States, and the implementation of these programs in five Northeastern States (Maryland, Massachusetts, New Jersey, Pennsylvania, and Vermont). The report also assesses how farmland protection programs fit into the broader array of rural land conservation programs.

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Executive Summary

All 50 States have enacted farmland protection programs to help slow the conversion of farmland to developed uses. Since the Nation's capacity to produce food and fiber is not at risk given present development patterns, we investigated which benefits, or "rural amenities," the public seeks to preserve when they supported these programs. Information on these amenities is useful in assessing the current state and future direction of farmland protection programs. Based on the idea that public preferences shape the design of government programs, we analyzed the comprehensive, nationwide set of legislation and policies that created and implemented these State programs. We found that farmland preservation programs in general seek to protect an array of rural amenities. We also found that purchase of development rights programs are most attentive to preserving rural amenities associated with actively farmed cropland. Our indepth review of several States' broad array of rural land protection programs suggests that farmland preservation program emphases appear to depend on State-specific circumstances, including the amount of land that remains in agriculture as well as the extent of land already in parks, forests, and other conservation programs.

Ensuring the continued availability of rural amenities may be the most important reason for farmland protection, especially for farmland protection near urban areas. Because "rural amenities" takes on different meanings for different people and different areas, effectively providing rural amenities is not as simple as determining how much farmland to protect. Consequently, information on the variety of rural amenities that can be provided by farmland, and how much they matter, can be useful in assessing the current state and future direction of farmland protection programs.

Following the economics of public choice literature, which suggests that public preferences shape the design of government programs, we examine the design and structure of State and local farmland preservation programs to discern the importance of various rural amenities. We start by examining variations in the enabling legislation for a wide variety of farmland preservation programs in the lower 48 States, focusing on language indicating the importance of preserving different rural amenities. Next, we investigate the design of several Purchase of Development Rights (PDR) programs, which permanently preserve rural land through the voluntary sale of development rights by parcel owners. Using data on 13 very active PDR programs in five Eastern States (Maryland, Massachusetts, New Jersey, Pennsylvania, and Vermont), we consider the implications of variation in the methods government agencies use to choose among parcels whose owners have offered to sell development rights. Lastly, since the kinds of amenities provided by farmland overlap amenities provided by other rural lands, for these five Eastern States, we conducted case studies of how farmland protection programs complement other rural land protection policies. The report also summarizes evidence from the literature regarding the public's preferences for rural amenities, and from original research regarding factors influencing the adoption of PDR programs.

Although the empirical information used in this analysis is not conducive to definitive conclusions on the values of different rural amenities, the study provides a number of insights on how farmland preservation programs operate as a policy instrument for protecting rural amenities. Some of these insights suggest the kind of rural amenities that seem to be most important, while other insights highlight concerns that affect the design and implementation of farmland protection policies.

Historical trends paint a picture of an urbanizing America, with farmland in decline across much of the Nation. Initial efforts to protect non-urban lands focused on the protection of forests and establishment of parks. The heaviest urbanization is occurring in the Northeast and the Lake States, with California, Florida, Texas, and the Appalachian States also undergoing extensive urbanization. By the 1950s, millions of acres of once clear-cut lands had regenerated into natural forests and were preserved through national and State forest and park systems. Programs to preserve farmland (and its amenities) were implemented beginning in the 1960s.

The need for government action to protect farmland and its amenities arises from land market failures. In an ideal world, a land market fully accounts for all the goods and services that may be provided by a plot of land. This includes not only commodities such as corn and developable tracts, but also the land's contribution to providing a multitude of other "non-market" outputs. For example, rural lands also provide food security, scenic landscapes, wildlife habitats, agrarian cultural heritage, and recreational opportunities. The values of these other outputs, although important to people, are often not reflected in the price of land when it is purchased or sold. If such values are not reflected in the price of land, landowners will have no incentive to consider these non-market goods when deciding how to use and manage their land. In these cases, private land markets fail to operate properly or efficiently. The use of government intervention through farmland protection programs is one means of ensuring the continued flow of these non-market goods and services provided by agricultural lands.

Surveys suggest that the public has a variety of reasons for protecting farmland. These reasons include protecting family farms, protecting water and wildlife, and protecting food supplies. In the few published studies in which people were asked directly about reasons for protecting farmland, no single reason appears to dominate. That is, whether people prefer preserving amenities specifically related to actively farmed landscapes, or amenities that could be provided by *any* rural lands (e.g., protected open space, or privately owned but undeveloped land) is not clear.

State and local governments use farmland preservation programs to protect a large number of rural amenities. Analysis of the enabling legislation of farmland protection programs suggests that preserving open space, scenic beauty, and cultural heritage are primary concerns for the majority of States that have farmland preservation programs. However, the more densely populated regions are often concerned with protecting the widest variety of rural amenities, while sparsely populated States and regions indicate less concern about preserving rural amenities. For example, the greatest interest in preserving rural amenities appears in the farmland protection legislation of States in the Northeast, Lake, and Pacific regions, while there is no mention of rural amenities in farmland protection legislation in North Dakota, Alabama, Mississippi, Oklahoma, Idaho, New Mexico, and Wyoming. In sparsely populated States, the continued relative abundance of rural amenities may make protective legislation seem unnecessary, whereas the more densely populated States often have less remaining farmland, leading them to enact a broad portfolio of programs to protect many types of rural amenities.

Most farmland protection programs focus on maintaining agricultural viability. Most programs favor protecting actively farmed agricultural landscapes rather than merely preserving open space. For example, the ranking criteria of

State- and county-level PDR programs in several Northeastern States place high priority on maintaining active agricultural operations, rather than passive or open space uses. The strong emphasis within PDR programs on active agriculture suggests that in the Northeast, public preferences are strongest for amenities that are uniquely provided by agriculture. But although active agriculture is the prime concern, it is not the sole concern. For example, many PDR programs require conservation plans, which help increase the quality of freshwater habitats by reducing soil erosion impacts.

The scope of other rural land protection policies may influence the extent to which farmland preservation programs concentrate on protecting rural amenities that are not dependent on active agriculture. Given the broad array of rural land conservation programs in many States, the observed priority that farmland protection programs give to agriculturally related amenities may be efficient. After all, other programs often focus on lands that do a good job of providing rural amenities that are not dependent on active agriculture (amenities like publicly accessible open space). The case studies highlight this potential, with farmland protection programs coexisting with a variety of other land-use policy instruments.

A tradeoff may exist between the long-term provision of some rural amenities from farmland and achieving a more desired mix of rural amenities in the near term. Many PDR programs give priority to farms that are considered most likely to continue to be actively farmed. In practice, this usually means favoring high-quality soils and row-crop farming. However, the public may be interested in preserving a broader mix of farmlands, one that includes pastures, orchards, and other less productive or unique land types. Should this be the case, then this focus on cropland suggests a tradeoff between providing the most desired mix of amenities today, and maximizing the long-term production of agricultural-related rural amenities. Given the evidence from the enabling legislation, and evidence from survey data, the proper balance between “choosing lands most likely to continue to be farmed” and “obtaining the best mix of preserved farmlands” is an open question.

The design of preservation programs has implications for the spatial pattern of permanently preserved lands, and hence the location of preserved rural amenities. The preservation programs reviewed generally incorporate criteria that target the preservation of farms that face development pressure, suggesting rural lands closer to population concentrations are preferred. Many programs also include criteria that favor preservation of larger farms and blocks of farms, which suggests a preference for preserving parcels in clusters. This latter strategy may be favored as a means of fostering long-term agricultural viability by helping to create a critical mass of agricultural businesses, and by reducing borders (and potential conflicts) with non-farm neighbors. Taken together, these priorities have impacts on the distribution of rural amenities—favoring those amenities that are best produced by larger blocks of farmland and which are accessible to urban populations (e.g., expansive scenic farm views within driving distance of cities).

However, other concerns are likely to lead to a distribution of preserved lands spread over a wide area. Some programs are specifically designed so that preservation funds are distributed across the jurisdiction. In others, the desire to preserve as much farmland as possible at least cost leads to prioritizing applications based on the lowest per-acre cost or on the largest discount at which landowners offer to sell

development rights. This can result in a more scattered pattern of preserved farms, or in preservation of lands distant from urban centers.

The Federal Government can play a role in the preservation of rural amenities in several ways. To the extent that the appreciation of “local” rural amenities is not limited to residents of a single State (or county), and to the extent that the American population moves across State lines, the Federal Government has a role in representing the Nation’s interests in rural amenities. These include funding local programs, helping to coordinate State and local preservation activities, and considering how Federal actions may affect the provision of rural amenities.

Farmland Protection

The Role of Public Preferences for Rural Amenities

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Introduction

America has a largely urban population living in a largely rural Nation—with approximately 3 percent of the land base that is urban¹ containing the vast majority (75 percent) of Americans. Despite the relatively small fraction of the land in urban uses, there is growing concern about the disappearance of farmland in some parts of the country. This concern is reflected in the adoption of an expanding array of farmland protection programs by nonprofit organizations and by county, State, and Federal governments.

Evidence of this concern includes:

- ◆ All 50 States have adopted right-to-farm laws and use-value assessment (American Farmland Trust (AFT)).
- ◆ Twenty-two States have implemented purchase of conservation easement programs (AFT).
- ◆ Since 1996, the Federal Farmland Protection Program has distributed \$50 million in matching funds to State and local farmland protection programs; and the 2002 Farm Bill increases this to approximately \$100 million per year for the next 6 years.
- ◆ In 1998, of 240 State and local ballot initiatives to curb urban sprawl, 72 percent passed. In 2000, 78 percent of 252 State and local measures were approved (Myers and Puentes).

What underlies this concern? Interest in protecting farmland arises in part from desires to maintain food security, support rural businesses, preserve an agrarian cultural heritage, safeguard natural resources, and prevent sprawl. It is noteworthy that reasons not

related to agricultural production are often prominent. That farmland protection programs are increasingly adopted, even though Federal programs that limit agricultural production continue,² suggests that guaranteeing food supplies at a national level may not be of greatest importance (Anderson et al.)³

In this report, we examine farmland protection programs to discern the importance of the various reasons for protecting farmland. In particular, we consider how farmland protection helps to maintain “rural amenities,” where “rural amenities” are roughly defined as those goods and services *other than food and fiber* that flow from agricultural land. Examples of rural amenities include “scenic views,” “an agrarian cultural heritage,” and “wildlife habitat.”

Although other goals (such as food security and sprawl prevention) are also cited by proponents of farmland protection, they have received a fair amount of review (Heimlich and Anderson). In contrast, the effects of farmland protection on the provision of rural amenities have received less attention. This report seeks to address this deficiency by considering just what rural amenities are, what makes them unique, and what the public’s preferences are toward these various goods and services. Since many farmland protection programs can be expensive to implement, understanding how the public values rural amenities can be crucial in determining preservation priorities.

¹ As defined by the U.S. census. Note that the Natural Resources Conservation Service’s broader category of “urban and built-up land” is about 3.9 percent.

² Although explicit limitations on production are no longer a condition for receiving farm support, several programs (such as the Conservation Reserve Program) do lead to reductions in agricultural production.

³ Concerns about protecting *local* food security may still be important.

Our focus is also motivated by the fact that providing rural amenities is often a byproduct of the agricultural production process. Rural landowners may not take into account that their land provides rural amenities when managing, and when considering whether to develop, their land. Hence, the normal workings of land markets may fail to adequately account for the benefits provided by rural amenities. Therefore, in many circumstances, public well-being will be enhanced when farmland protection programs act to maintain the flow of rural amenities from agricultural lands.

In fact, the provision of rural amenities is one of the most important reasons for farmland protection, especially for farmland near urban areas. Furthermore, given the wide variety of rural amenities, effectively providing rural amenities is not as simple as determining how much farmland to protect. Thus, information on what rural amenities can be provided by farmland, and how much these different rural amenities matter, can be useful when analyzing the effectiveness of farmland protection programs.

Farmland protection programs take many forms, varying from the use of zoning to regulate land held by the private sector to programs that offer incentives to encourage private landowners to continue farming (and thereby help maintain the flow of rural amenities). These include a variety of conservation easement programs, wherein the public pays a farmer to refrain from developing the land but the land remains in private ownership.

Despite the numerous programs to protect rural open space and to preserve farmland, very little is known about which individual rural amenities taxpayers really care about when they support farmland protection programs. For example, does the public care most about visual landscape aesthetics, about lessened congestion, about national and local food security, about viable farms, or about something else? Do these preferences vary across the Nation, and if so what explains this variation?

Our analysis is based on a close look at the experiences of State and county governments; in particular, we consider the structure and implementation of laws and programs designed to protect farmland. Representing legal and fiscal commitments, these programs—the legislative intent motivating them and the program

design—may provide insight into which rural amenities are considered most important by the public.

Prefacing our analysis, in the next chapter we explain our conceptual framework in terms of land market failures, review current land use patterns across the Nation, and describe the various kinds of farmland protection programs. We review the economic literature concerning rural amenities, and summarize some general findings on what factors influence the adoption of farmland protection programs.

The analysis starts with a broad overview of the legislative intent motivating formation of State farmland protection programs. We then more closely examine the priorities of county-level conservation easement programs in several Northeastern States, and end with several State-level case studies that place farmland protection programs within a broader array of rural land protection programs.

From these strands of evidence we derive some tentative conclusions as to the importance of “farming” in farmland protection programs and discuss future research directions. In general, we find that these programs largely focus on the protection of active agriculture, with many programs giving priority to the preservation of productive soils on which field crops are typically grown. This strategy holds implications for the set of amenities likely to be preserved. For example, emphasizing preservation of cropland vs. pastureland yields different scenic views, and holds different implications for water quality, wildlife habitat, and other environmental amenities. It also implies a tradeoff between long-term survival of some form of agriculture, at the possible cost of providing a less than optimal mix of rural amenities.

Although empirical evidence from studies that directly question taxpayers about their reasons for supporting farmland preservation programs is limited, it suggests that, in some States, the objectives of the farmland preservation programs do not coincide with voter priorities—particularly with regard to the relative importance of farmland as open space. However, our review of several States’ suites of rural land programs highlights the importance of considering the presence of complementary programs that also protect rural amenities, a consideration that helps explain the priorities observed in existing farmland protection programs.

Farmland Protection Programs and Rural Amenities

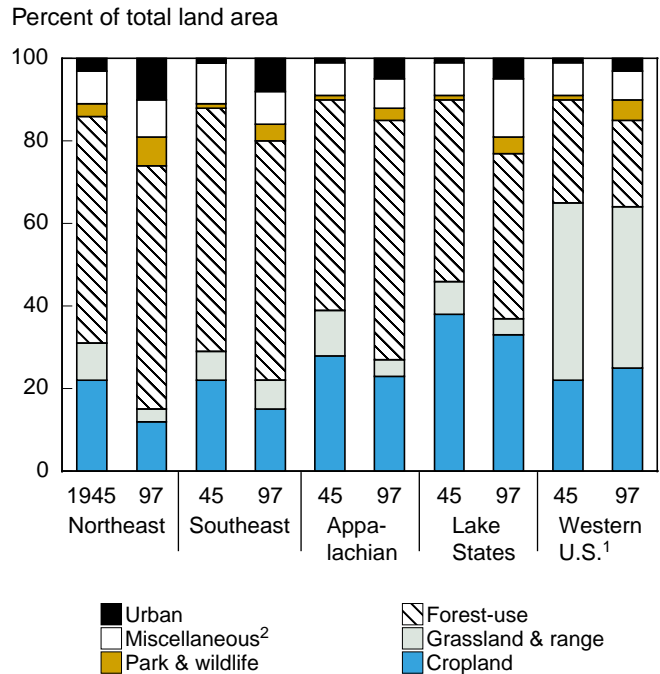
The Loss of Farmland

Historical trends in land use tell a compelling story about the extent and location of farmland losses.⁴ Figure 1 depicts land uses at two snapshots in time, 1945 and 1997, and reveals that cropland has decreased east of the Mississippi River, while remaining roughly constant in the Western portion of the Nation. Declines in rangelands and grasslands have occurred across the Nation during this period. Urban lands have increased everywhere, as have lands devoted to parks and wildlife. Figure 2, which depicts changes in cropland since 1945, clarifies that the greatest proportional losses in cropland have occurred in the Northeast, followed by the Southeast, Appalachian, and the Lake States. Figure 3 shows a similar pattern for urbanization, with the fraction of the landscape in urban uses increasing most in the Northeast. However, these trends mask agricultural land losses and increases in urban land at more local levels. As shown by the disaggregated perspective of figure 4, the heaviest urbanization between 1982 and 1992 occurred in the Northeast and the Lake States, with California, Florida, Texas, and Appalachian States also undergoing extensive urbanization.

As outlined in box on page 5, initial efforts in the late 1800s and early 1900s to protect non-urban lands were focused on the protection of forests and establishment of parks. By the 1950s, millions of acres of once clear-cut lands had regenerated into natural forests and were

⁴ Words used to describe land often mean different things to different people or the same word might be used interchangeably with others to refer to the same concept. The Economic Research Service usually defines these terms as follows. Farmland - the Census of Agriculture definition of land in farms where a farm must have over \$1,000 of sales. Agricultural land - all land used for agricultural purposes including farmland and public land not included in the Census of Agriculture. Rural land - all land not in urban uses. Cropland - the ERS definition includes harvested cropland, summer fallow, failed cropland, cropland pasture, and idle cropland. Urban land - ERS generally uses the Census of Population definition, which includes residential, commercial, industrial, institutional, streets and roads, major airports, and urban parks. This should not be confused with the National Resources Inventory definition of urban, which includes a "built-up" category. These terms are further defined and explained in Vesterby and Krupa, 2001. A newer term, "working lands," is coming into wider usage, and includes forest land as well as agricultural land, and may also include environmentally sensitive land that "works" to clean the water and air.

Figure 1
Land change, by region, 1945 to 1997

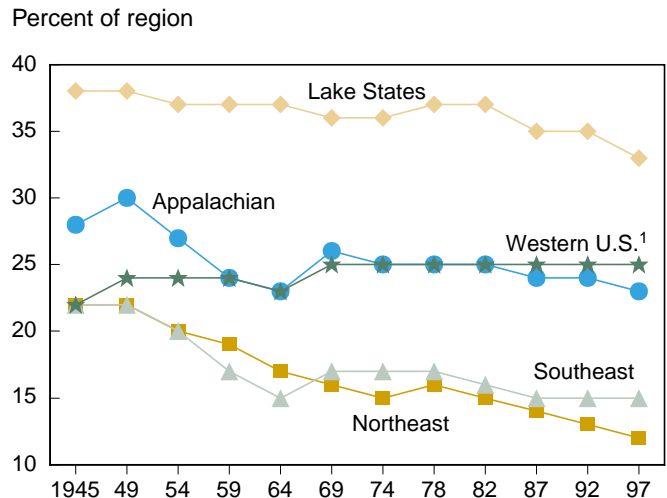


¹ Cropland gain regions include Northern and Southern Plains, Mountain, Pacific, Corn Belt, and Delta Regions.

² Includes rural-transportation, industrial, residential, marshes, deserts, and unclassified lands.

Source: Vesterby, M., and K.S. Krupa (2001). "Major Land Uses." (Database 1945-97).

Figure 2
Percent of region that is cropland, 1945-97



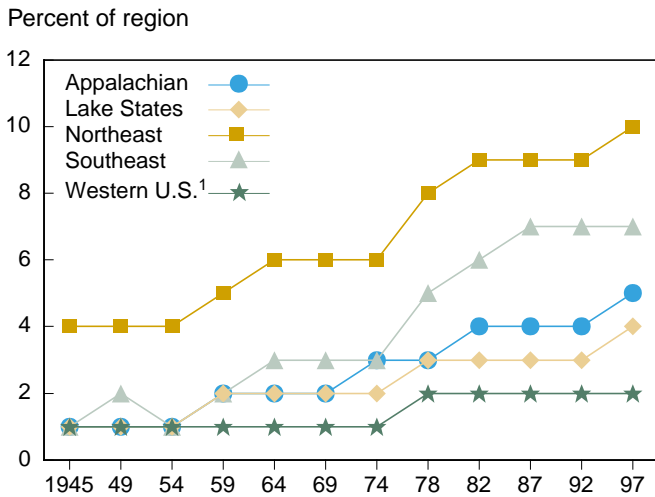
¹ Includes Northern and Southern Plains, Mountain, Pacific, Corn Belt, and Delta Regions.

Source: Vesterby, M., and K.S. Krupa (2001). "Major Land Uses." (Database 1945-97).

preserved through both national and State forest and park systems. In the post-World War II years the Nation's population increased significantly. Coupled with declines in household sizes, this contributed to

significant increases in the demand for housing (Heimlich and Anderson). Metropolitan areas expanded, and demand was also accommodated by low-density development in rural areas—sometimes at the expense of prime agricultural land.

Figure 3
Percent of region that is urban land, 1945-97



¹Includes Northern and Southern Plains, Mountain, Pacific, Corn Belt, and Delta Regions.

Source: Vesterby, M., and K.S. Krupa (2001). "Major Land Uses." (Database 1945-97).

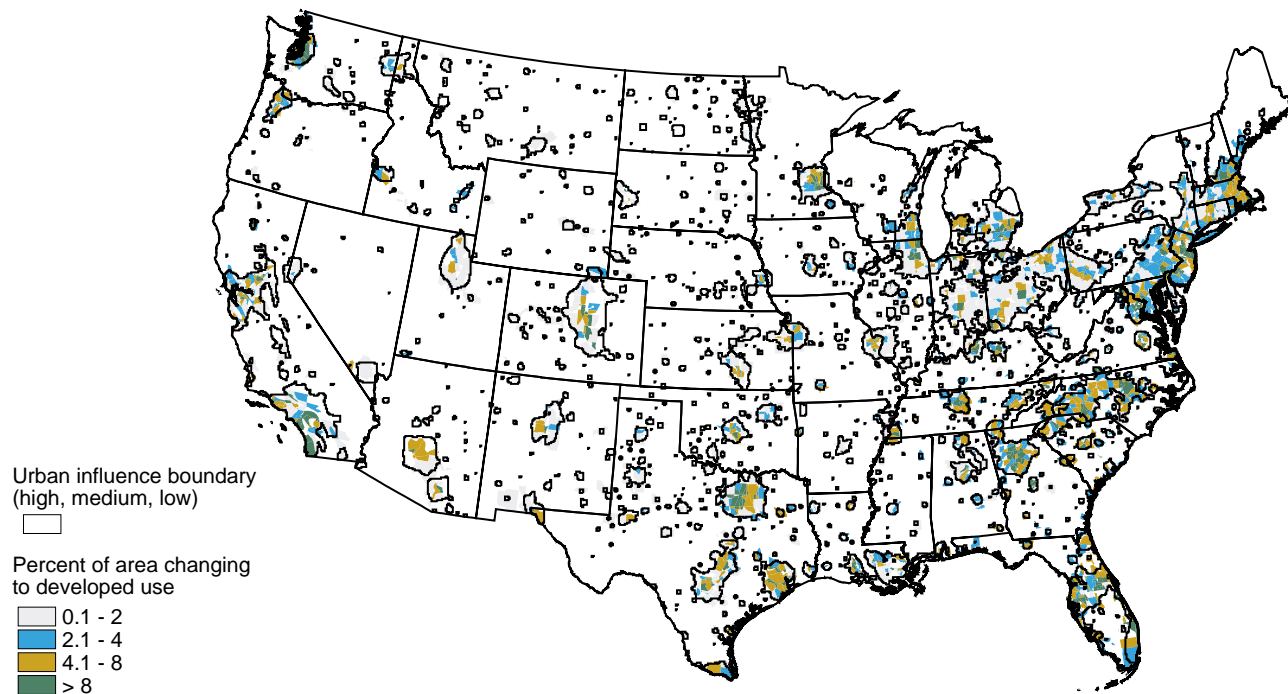
The historical trends paint a picture of an urbanizing America with farmland in decline across much of the Nation. This has contributed to mounting concerns about farmland losses. The popular press provides some evidence of the extent to which people care about these losses of farmland:

Consider the following:

◆ "Sprawl is claiming farmland at the rate of 1.2 million acres a year. Throw in forest and other underdeveloped land and, for net annual loss of open space, you're waving good-bye to more than 2 million acres" (Mitchell, *National Geographic*, 2001).⁵

⁵ Many different estimates have been made of the rate of urban conversion. These range from about 0.75 million acres annually to 2.9 million acres, depending on the source and time period. ERS estimates urban conversion from all rural land, which includes everything not urban, at about 1.0 million acres per year. See: http://www.ers.usda.gov/Emphases/Harmony/issues/arei2000/AREII_1landuse.pdf

Figure 4
Comparison of estimated urban growth boundaries and percent of area changing to developed uses, 1982-92



Source: Barnard, 2000. Note that about 15 percent of the Nation's 1 billion acres of farmland falls within urban influence boundaries.

Preservation of Non-Urban Lands, With a Focus on the Northeast: 1800s-1960s

The historical backdrop of changes in land use helps form the context within which farmland protection policies are formed. For example, the Northeastern States offer an interesting perspective on the broad trends in American land use. Although most Northeastern States now have active farmland preservation programs, early State land preservation efforts were directed toward forests and parks.

From pre-colonial times until the early 1800s, the Northeast States were almost entirely covered with dense forest, with forest conversion occurring mostly to obtain firewood and to clear farmland. By 1850, demand for agricultural products to supply the coastal population centers and the need for timber and fuelwood, had led to the clearing of large areas of forest (Fredrick and Sedjo). Between 1800 and 1850, the area in agricultural use moved directly counter to the trend in forest acreage. These trends continued for the next several decades, leading to a four-fold increase in cropland acreage (Fedkiw). By the 1920s, about 384 million acres (40 percent) of the U.S. indigenous forest had been cleared (Fredrick and Sedjo).

However, several factors, such as the opening of fertile cropland in the Midwest, reversed the trends in both agricultural land use and

forestland use. Cropland expansion peaked in the Northeast in the 1880s, followed by abandonment of marginal farmlands and regeneration of natural forest (Fedkiw). Nationally, by the 1920s, the area of U.S. forests had stopped declining. In New England, forestland in 1980 had returned to levels substantially above those of the mid-1800s.

Along with broad changes in land-use patterns, the role of government in land management has evolved. Prior to the late 1800s, land policy had been one of transferring the “public domain” to State and private ownership (Fedkiw). However, the rapid demise of the forested area of the United States in the last half of the 1800s contributed to efforts to preserve and restore publicly owned forests and parks, both at the national and State levels.

Starting with Yellowstone (1872), by 1916 the concept of a system of national parks was established with the founding of the National Park Service (NPCA). Currently encompassing about 384 units covering more than 83 million acres (with most of these in the West and Alaska) the interest in these lands was largely from the perspective of preserving lands of extraordinary beauty and uniqueness. Somewhat paralleling the development of the

National Park system was the development of the National Forest system. Starting with the Forest Reserve Act of 1891, the National Forests system was established in 1907 (Clawson and Harrington). These National Forests accounted for 161 million acres by 1920, with 1.6 million acres located in four Eastern States. From 1920 to 1945, 22 million acres were added to the national forest, much of these in the East.

The concept of State parks also emerged near the end of the 19th century (Fedkiw). Although there were a few State parks established in the late 19th century (such as New York’s Niagara State Reservation in 1885) it was not until the 1920s that State park systems were broadly instituted. During the 1930s, some States incorporated tax delinquent lands, often cutover and abandoned forestland, into State forests. By 1950, there were 1,725 State parks, accounting for 4.7 million acres. Today, there are more than 12 million acres administered by State park agencies (NASPD).

More recently, Congress enacted the Land and Water conservation fund in 1964. Since then, 5.6 million acres of local, State, and Federal parks and recreation land have been acquired, largely near heavily populated areas.

- ◆ “Sprawl vaults to the top of concern lists in local polls” (Pierce, *Detroit Free Press*, 2000).
- ◆ “The importance of preserving DuPage County’s natural resources has been reaffirmed time and time again throughout the district’s 85 year history” (Pierotti, *Chicago Tribune*, 2000).
- ◆ “In California’s Central Valley, more than 12 percent of the farmland has already been paved over. If the current trend continues, the valley will lose more than one million acres of farmland by the year 2040, much of it on the best soils for growing crops” (Sanders, *California Country*, 1999).
- ◆ “If Maryland’s recent growth patterns do not change, development will consume as much land in central Maryland *alone* over the next 25 years as it has during the entire 368 year history of our State” (Glendening, 2001).
- ◆ “What Price Preservation? Some on Council Wonder—As Mayor John Delaney’s land saving Preservation Project finishes its second year, the city of Jacksonville can boast more than 16,000 acres that will never sport a rooftop, strip mall or smoke stack” (Rivedal, *Florida Times Union*, 2000).
- ◆ “In West Va., Getting Fairfaxed.” (Kunkle, *Washington Post*, 2001).

Land Market Failures as a Reason for Farmland Protection

Concerns over farmland losses have generated increasing support for farmland protection programs. To understand why government actions may be necessary to protect farmland, it is useful to consider the basics of rural land markets, and how rural land markets on their own can fail to provide socially desired quantities of land in agricultural uses.

Rural lands have many possible uses. For example, rural lands can be used as cropland (providing intensive production of food and fiber), or as forest and pastureland (providing less intensive production of food and fiber). Alternatively, rural lands can be developed (providing lots for homes and businesses).

Private landowners interested in maximizing the financial returns from their land will use land in a way that yields the highest possible returns. Characteristics such as land quality (e.g., soil fertility, slope, and permeability), surrounding land uses, and local population densities will help determine the highest returns land can generate. When land markets are *properly func-*

tioning, the price of land will reflect the value of land in its most profitable use. That is, land with a value in an agricultural use that exceeds all other use values will be farmed; whereas land with a value in a developed use that exceeds its agricultural use value will be developed. Doing otherwise would entail financial loss (or foregone opportunities for financial gain).⁶

A properly operating land market will fully account for all the goods and services that may be provided by a plot of land. This includes not only “marketable” goods (such as corn and developable tracts), but also the land’s contribution to providing a multitude of other outputs. As outlined in box on the next page, rural lands also provide a variety of “non-market” outputs that include food security, employment opportunities, aesthetically pleasing landscapes, wildlife habitats, agrarian cultural heritage, and recreational opportunities. Although these outputs may be important to the American population, the values of these outputs are not always reflected in the price of land when it is purchased or sold. When this happens, land markets fail to operate properly or efficiently.

This failure happens because farming generates *externalities*:

- ◆ *Positive externalities* are products that are valued by society, but for which the farmer receives no direct monetary return. Examples include scenic views and the farmland’s contribution to maintaining a community’s rural character.
- ◆ *Negative externalities* are unpleasantities that the farmer does not have to pay anyone to accept. Examples are the erosion and unpleasant odors that a farming operation may produce.
- ◆ As explained in the box on p. 8, positive and negative externalities generally have a *non-market, public goods* nature.
- ◆ Since the value of externalities is not reflected in the market value of land, landowners have little incentive to consider these non-market public goods when managing their land.⁷

⁶ The actual usage of any given plot of land will reflect idiosyncratic factors, which explains locales with a mixture of land uses. For example, especially fertile farms may stay in agriculture while their neighbors develop, or a farmer who greatly prefers his agrarian lifestyle may hold onto his land even when offered substantial dollar sums. Conversely, farms located in easily accessible locations, or held by farmers nearing retirement, may be sold to developers at the earliest opportunity.

⁷ Appendix 1 outlines the economic logic addressing this problem of the private provision of public goods.

Non-Market Outputs from Agricultural Lands

In addition to crops and other marketed outputs, a variety of other “non-market” outputs can be produced on agricultural lands. These include:

Positive

*Environmental**

- ◆ Open space
- ◆ Soil conservation
- ◆ Biodiversity
- ◆ Wildlife habitat
- ◆ Recreational opportunities
- ◆ Scenic vistas
- ◆ Isolation from congestion
- ◆ Watershed protection
- ◆ Flood control
- ◆ Groundwater recharge

Rural Development

- ◆ Rural income and employment

- ◆ Viable rural communities
- ◆ A diversified local economy

Social

- ◆ Traditional country life
- ◆ Small farm structure
- ◆ Cultural heritage

Negative

- ◆ Odor
- ◆ Nutrient/pesticide runoff
- ◆ Soil erosion
- ◆ Ecosystem fragmentation

* Note that the value of several of these outputs depends on the alternatives. For example, agricultural lands may offer better wildlife habitat, more biodiversity, and a greater degree of watershed protection than urban lands, but may provide fewer of these services than forestland.

Consider a farmer who operates a dairy farm. The farm has a farmhouse, dairy barn, a feed silo, pasture for the dairy herd, and land devoted to row crops. One of the positive externalities provided by this farmer is “a pleasing pastoral panorama,” which urbanites enjoy when they take weekend drives through the country. However, the farmer is not compensated for providing these scenic views (since it is not possible to exclude any passerby from enjoying the view for free). Lacking any means of receiving compensation for providing this “pleasing pastoral panorama,” landowners will not consider the societal value of providing this beneficial good when managing the land.

In particular, missing in the farmer’s calculations as to whether to sell the land is the value of the pleasing pastoral panorama that the farm provides to neighbors and to sightseers, a value that will be lost when the land is developed. Thus, because “pleasing pastoral panoramas” and other amenities are not valued in private land markets, farmlands may be prematurely converted to developed uses even though society

would prefer to have them remain in agriculture. This happens because the land will be converted when its development value (the revenue from selling the lands as housing lots) exceeds the agricultural value (the expected revenue stream from continued dairy operations), without considering the value of the rural amenities produced by the farmland.

Since rural lands can produce positive externalities, and since private markets fail to adequately account for the value of these non-market public goods, then as a society we are potentially better off when the government intervenes to correct this failure.⁸ Despite well-known problems with designing and implementing government programs to provide public goods (as described in Appendix 1), the use of farmland protection programs is one means of ensuring the continued flow of non-market goods provided by agricultural lands.

⁸ Similarly, society is potentially better off when the government intervenes to alleviate negative externalities, such as by mandating or subsidizing environmentally sensitive management practices.

Externalities, Non-Market Goods, and Public Goods

Many rural amenities are positive externalities generated by agricultural lands that have a public goods nature. In this box we define these terms.

Economists use the term **externality** to describe a harmful or beneficial side effect that occurs in the production, consumption, or distribution of a particular good. Externalities affect the well-being of others in a way that is not transmitted by market prices. For example, farming can cause negative externalities (such as sedimentation of streams) that the farmer does not have to pay for, and positive ones (such as scenic landscapes) for which he receives no compensation. Since the costs (or benefits) of externalities are

not reflected in the market, economists classify externalities as non-market goods.

Public goods are distinguished from the more familiar private goods by *nonrivalness* and *nonexcludability* in consumption. Nonrival means that one person's consumption (enjoyment) of the good or service does not diminish another person's enjoyment of the same product—the good is not used up by individual or even multiple consumers. In contrast, with a private good, one person's enjoyment of the product (say a candy bar) forecloses the possibility of a second person's enjoying the same item. Nonexcludability means that once produced, anyone can enjoy the good—the producer cannot limit access to the good. With private

goods, the consumer must purchase the good from the producer.

Markets do not work well with public goods; there is no incentive for consumers to pay for the good, and entrepreneurs cannot selectively withhold the good as a means of countering nonpayment. That is, once an entrepreneur provides the good for one consumer, it is available to all. Given that consumers have no incentive to pay, private firms will not be motivated to supply the good.

Summarizing, externalities and public goods are examples of non-market goods. Moreover, rural amenities are frequently public goods that are generated as externalities of agricultural production.

Farmland Preservation and Rural Amenities

It is useful to classify the goals served by farmland protection programs into several broad categories:

- ◆ Ensuring orderly urban development (the prevention of sprawl)
- ◆ Maintaining agricultural production (protecting local and national food security)
- ◆ Supporting the agricultural economy (creating employment opportunities and supporting rural businesses)
- ◆ Protecting environmental services (pollution reduction and natural resource protection)
- ◆ Providing rural amenities (scenic views, agrarian cultural heritage, etc.)

In this report we consider the latter two items (environmental services and rural amenities), and give special attention to the provision of rural amenities from agricultural lands. We adopt this focus because:

- ◆ It is unclear whether farmland protection programs will have any significant impact on national

food security, or do much for beleaguered rural communities:

- Despite what may seem to be alarming trends in farmland loss, the United States has an abundance of agricultural lands (Heimlich and Anderson, Vesterby and Krupa, Vandell and Malpezzi). Conversion of farmland to other uses is small relative to this base, and there is little evidence to suggest that our Nation faces any long-term threat to productive capacity.
- In some locales the agricultural economy may be fragile, and government involvement may help maintain both jobs and related businesses. However, it is likely that these effects are small, and may be addressed without interventions in land markets (Gardner).
- ◆ The protection of local food security is a variant of both these concerns. Barring a massive breakdown of the Nation's transportation infrastructure, this is not likely to be a serious problem.
- ◆ Many rural amenities exhibit the characteristics of public goods, and (as discussed in the previous section) are likely to be ignored by the normal workings of land markets.

- ◆ While receiving some attention (Heimlich and Anderson), the relative importance of rural amenities provided by farmland protection programs is still an open question.

Broadly defined, rural amenities encompass a variety of goods that require a rural setting and that cannot be reduced to a transfer of a commodity. Two salient features underlie this broad definition: “rural settings” and “non-market” goods.

Rural settings refer to lands that begin at the city’s edge.⁹ Agriculture is an example of a land use one would find in a “rural setting.” Since a “city’s edge” is often not sharply delineated, the term “rural settings” is meant to be suggestive of landscapes defined, but not dominated, by a human presence.

The “non-market” feature refers to the value of an amenity as a function of things that are not reflected in its market price. In the case of rural amenities, value is derived from where it is produced and consumed. The rural amenity “good” or “service” depends on the fact that a rural landscape was involved in its production. Thus, a bushel of corn usually lacks this feature—the value of corn is derived from the nutrition and flavor of the corn, and generally not in where or how it was produced (except in that it may affect the qualities of the corn). Conversely, the benefits derived from rural amenities (such as scenic views) are inherently linked to a rural landscape.

In fact, enjoyment of rural amenities may not even require a tangible experience: the mere existence of a rural setting may be of value. For example, the knowledge that our Nation’s farming heritage is being maintained, that the sturdy yeoman farmer ever yet tills the soil, may be of value to many people in an otherwise urbanized society. Again, this value does not flow from the foods and fiber provided by this industry, but from the “where” (and by whom) this effort takes place.

Note that the division between “rural amenities” and the other four goals is not necessarily hard and fast. For example:

- ◆ The creation of employment opportunities reflects the normal workings of the market economy. Yet many people, even those not looking for a job, feel

better about a society where there is an abundance and variety of employment opportunities, including employment opportunities in rural areas. In that sense, employment opportunities have a non-market component.

- ◆ People often value unique aspects of locally produced farm products, a preference that may be difficult to capture in food markets. In such cases, farmland protection for “productive reasons” can be considered to be a case of “providing a rural amenity.”
- ◆ Environmental services can often be considered to be rural amenities. However, the connection to farmland protection is less clear—since environmental services can often be modified without changing land uses (say, by more careful farming practices). Although the same can be true of rural amenities (some rural lands provide more amenities than others), the link between rural land uses and rural amenities is stronger than that between rural land uses and environmental services.

Given the broad criteria outlined above, rural amenities encompass a wide array of goods. A number of economists have considered the issue of what constitutes rural amenities:

- ◆ Crosson (1985) placed strong emphasis on the importance of the intangible outputs provided by rural amenities, including spatial benefits, wildlife and scenic habitats, agrarian fundamentalism, and the sense of identifiable community. He also noted the importance of the rural scene as a future base for residential and commercial development with its attendant association with employment benefits provided by the rural sector.
- ◆ Gardner (1977) pointed out the importance of local and national food production, local jobs derived from the agricultural sector, and the need for more coordinated use of both rural and urban land uses. He also discussed the benefits of environmental amenities, which include open space and environmental and natural public goods.
- ◆ Halstead (1984) placed major emphasis on the importance of non-market elements such as wildlife habitat, scenic views, and recreational benefits. Beasley et al. (1986), while accepting previously known and identified benefits, emphasized irreplaceable scenery and historic significance in explaining U.S. cultural development. Bowker and Didychuk (1994) cited the importance of open space

⁹ In the United States it is useful to add another boundary—where the wildlands begin at the edge of rural settings.

Policies for Protecting Farmland

Agricultural support laws can be viewed as forms of farmland preservation to the extent that they seek to help farming remain financially viable in an increasingly urban and suburban American landscape. The following terms define several land-use planning techniques and policies with a farmland preservation focus.

Agricultural conservation easements

Agricultural easements involve the placement of permanent or long-term restrictions on individual parcels that prohibit future suburban or urban development. While retaining full ownership in all other respects, landowners voluntarily give up their development rights, and in return receive an economic benefit—cash (including cash equivalents) or an income tax deduction, or a combination of the two. The three methods for acquiring easements are:

1) Purchase of development rights (PDR)

PDR programs, also known as “purchase of agricultural conservation easements” (PACE) programs, involve direct compensation to the landowner for the value of the development rights. The value of development rights is typically calculated as the difference between the market value of the land

and its value for farm production. Some programs pay the lower of the estimated value of the development rights or the amount at which the landowner offers to sell the rights.

2) Donation or charitable contribution

This strategy involves an outright gift by the landowner of the development rights to the preservation agency, resulting in a Federal (and in many cases, State) income tax deduction.

3) Transfer of development rights (TDR)

TDR programs result in preservation by allowing landowners (in designated “sending areas”) to transfer the development rights to an area where urban growth is desired (“receiving areas”). Developers purchase the TDRs and use them to develop at densities higher than what is allowed by the underlying zoning in receiving areas. Sellers and buyers negotiate the sales

price of TDRs privately. A TDR arrangement may be a condition imposed on new development, and the developer carries the cost of acquiring the rights from an agricultural landowner.

Agricultural districts

Several States allow farmland owners to form agricultural districts in designated areas. Once enrolled in a district, the landowner agrees to maintain the land in an agricultural use for a minimum number of years, after which the landowner can withdraw his land from the district. District status can provide insulation from nuisance complaints of normal agricultural activities and property tax credits in some areas. Also known as agricultural preserves, agricultural security areas, agricultural incentive areas, agricultural development areas and agricultural protection areas.

Continued on page 11

and scenery, and also stressed the significance of a blend of wildlife and traditional country living. Similarly, Duffy-Deno (1997) dealt at length with scenic beauty and open space.

- ◆ Rosenberger and Walsh (1997), like the previous authors, stressed the traditional values of open space such as visual effects and recreation, but also stressed the therapeutic benefits of rural amenities. They also emphasized fundamental environmental amenities such as soil and water conservation provided by watershed protection; as well as the preservation of irreplaceable plant and animal habitat and biological diversity. Kline and Wichelns (1996) placed a strong emphasis on environmental

quality based on natural places, wildlife habitat, and the importance of the maintenance of groundwater quality. They also stressed the importance of farming activity and local food production.

- ◆ Bergstrom (1998) provided a complete listing, stressing the significance of an area as a place to live, work, and play. He emphasized the role of recreation, the importance of space, and a lack of congestion. He placed in the next most importance priority habitat and the general environment (including topographical features). He also addressed the interrelationships between these amenity features and natural water supply systems controlling water quality and quantity.

Continue from page 10

Agricultural protection zoning

Agricultural protection zoning is intended to segregate agriculture from other land uses. The zoning is based on minimum parcel size, and limited allowable use discourages sales for other uses and restricts uses to farm-related activities (farm family and labor housing, processing, and marketing). Some jurisdictions provide a range of agricultural zones, ranging from “exclusive” to other categories that allow a mixture of uses including “hobby” or noncommercial farms and large-lot residences.

Preferential or differential assessment of farmland

All States have enacted preferential (or differential) tax assessment laws related to agricultural land. Preferential assessment laws (also known as current use assessment, current use valuation, farm use valuation, use assessment, and use value assessment) direct local governments to assess agricultural land at its value in current agricultural uses, instead of its full market value

for potential urban (developed) uses, which, near cities, is generally much higher. The intent of these laws is to remove a disincentive for conserving farmland in the face of development pressure. Taxation at preferential assessment rates is often offered to farmers in exchange for agreement not to develop for some time period. Repayment of accrued tax reductions (called rollback provisions) can be imposed if the land is developed before the end of the agreed term. Wisconsin and Michigan use preferential assessment, but provide the benefits to farmers indirectly through State income tax reductions.

Right-to-Farm

All States have enacted right-to-farm legislation. Right-to-farm laws are meant to provide farmers with protection against nuisance lawsuits brought by new, urban-oriented neighbors objecting to normal farm activities, and sometimes against local-government-imposed ordinances that unreasonably restrict agricultural activities. Some right-to-farm laws require that notices be attached to deeds of all proper-

ties in protected agricultural areas. The notices serve as cautions to potential residential and recreational land buyers that the property may be subject to dust, odors, noise, and other inconveniences associated with location near farm operations. Further, such disamenities occur even when farm operations are using generally accepted (agricultural) management practices and also are otherwise in compliance with Federal and State laws.

Urban growth boundaries

Urban growth boundaries are planning boundaries that identify the outer limits of an urban area’s long-term growth. Usually designed as rings around central cities or other urban concentrations, the boundaries seek to slow down growth, encourage compact and efficient developments, steer more development to established urban neighborhoods, reduce the cost of public services, and preserve natural resources. Farmland protection is at least a secondary purpose of this technique.

Source: American Farmland Trust, Daniels and Bowers.

- ◆ Mullarkey, Cooper, and Skully (2001) summarized some multifunctional and welfare-enhancing amenities, and possible disamenities, produced from agricultural lands. Important environmental/social benefits associated with agriculture are scenic vistas, traditional and historic country life experiences, wildlife habitats, small farm structures, flood control benefits, and the enduring presence of a cultural heritage. On the more quantitative side, rural developmental and food security features include supporting rural employment and income, eliminating hunger, maintaining viable rural communities, and guaranteeing a safe and secure food supply.

Figure 5 summarizes a variety of rural amenities and orders them in terms of dependence on the presence of agricultural activities in a rural landscape. At one end are goods and services that may be produced in rural landscapes, but do not require active agriculture. We classify outdoor recreation at this end of the spectrum.¹⁰

¹⁰ In fact, “rural” settings may not be necessary; city parks can provide outdoor recreational opportunities as can wildlands.

Figure 5

Rural amenities produced by farmlands

Agrarian cultural heritage includes: *knowing that the rural character of the land is being maintained, and knowing that farming as a way of life continues in your community.*

Rural pleasantries include: *walks in pastoral settings, scenic drives in the countryside, and visiting local farms.*

Support for rural communities includes: *a diversified rural economy, and viable rural communities.*

Recreational opportunities and environmental services include: *fishing, swimming, birdwatching, biodiversity, watershed protection, and flood control.*

Requires active local agriculture

axis of need for active local agriculture

Does not require active local agriculture

What about local food security? Local food security is enhanced by extensive local agriculture. However, it can also be supplied by more intensive use of fewer acres, or by reliable inter-regional markets in food products.

“Local food security and quality”¹¹ and “supporting rural communities”¹² lie in the middle. The other end includes goods that are intimately tied to agricultural landscapes, in the sense that these goods would have little value (or be difficult to produce) without agriculture. We place “rural pleasantries” and “agrarian cultural heritage” at that end of the spectrum.

Note that our use of the term “rural pleasantries” incorporates the kinds of enjoyable features of the rural landscape that many people may think of when casually using the term “rural amenities.” That is, we define rural amenities more broadly, a definition that incorporates rural pleasantries along with a variety of other goods and services.

Although the above discussion is framed in terms of agriculture, the rural landscape contains several other broad categories of land types, including

- ◆ woodlots and commercial forestlands;
- ◆ rural parks;
- ◆ natural resource areas (such as wetlands); and
- ◆ rural communities.

¹¹ Of course, local food security, and local food quality, may be strongly correlated with the extent of agriculture. However, intensive use of farmland, reliable inter-regional trade, and industrial food production technologies (such as hydroponics and greenhouses) all provide alternative means for ensuring local food supplies in the face of a decline in farmland acreage.

¹² Rural communities can be supported in a number of ways, such as creating roads and other public works, developing non-agricultural sources of employment, and supporting agriculture.

Each of these land types also produces some rural amenities similar to those produced from agricultural lands. For example, “open space” can be provided by rural farmlands and by rural forestlands. Although in this paper we focus on agricultural lands, in several sections (such as in the case studies), we place our findings concerning farmland protection programs within the broader context of the multiplicity of rural lands. This exercise helps explain the emphasis of existing farmland protection programs. Depending on the value people place on specific rural amenities, the most cost-effective use of the rural land protection dollar may or may not be to spend it on maintaining land in agriculture.

Farmland Protection Programs

Since the advent of farmland protection programs in the 1960s, the suite of farmland programs has steadily broadened. As explained in the box on pages 10-11, farmland protection programs range from zoning to purchase of development rights. The adoption of farmland protection programs has followed a general progression across this range. The initial policy often is agricultural/rural residential zoning, which is a regulatory approach mainly intended to isolate incompatible land uses and to limit the density of residential development (Solberg and Pfister). Since zoning is often viewed as ineffective or as unfairly infringing on landowner rights (Whyte), a second generation of policies relies upon increasing the economic viability of agriculture. The prime example is differential assessment (some form of which exists in all 50 States), which mandates

that farmland be taxed at its agricultural value rather than its developed value. When this economic incentive is viewed as insufficient,¹³ a third generation of programs combines tax relief with the creation of regions in which agriculture is the preferred and protected use. These include the formation of agricultural districts, the passage of right-to-farm laws, and designation of urban growth boundaries.

Since these additional benefits are often insufficient to offset the revenue available to the landowner from development, another generation of policies was devel-

¹³ Differential assessment programs may impact the *timing* of development. Given that the tax savings are small relative to the opportunity cost of delaying development, the likelihood that such an incentive will succeed in completely withholding land from development is small.

oped in which the development rights are severed from the fee-simple bundle of ownership rights, permitting the agricultural land base to remain intact. These programs, often called Purchase of Development Rights (PDR) or Purchase of Agricultural Conservation Easements (PACE) programs, place a conservation easement on the deed that prevents non-agricultural development into perpetuity, but compensate the landowner for the forsaken property rights. In particular, PDR programs allow the government and other organizations to obtain a “partial interest” in the land (Wiebe). The government (or private organization) can then extinguish development rights to agricultural lands, with the private landowner retaining all other rights, including the right to continue farming. As detailed in the box on this page, in recent years, the Federal government has begun to help fund State and local PDR programs for both forest and farmland.

Purchase of Development Rights in Federal Programs

The Federal Government has a long history of supporting domestic rural land conservation programs. Most of these programs have involved cost-sharing with farmers to encourage conservation practices and the idling of environmentally sensitive cropland (see Claassen et al. for a review of Federal rural land conservation programs). However, in recent years the Federal Government has become involved with the preservation of the uses of rural lands, especially farmland and forestland. In particular, the U.S. Forest Service’s Forest Legacy Program (FLP) and the Natural Resources Conservation Service’s Farmland Protection Program (FPP) are designed to preserve land uses through the purchase of development rights.

The FLP program purchases development rights with the dual aims of “promoting effective forest land management and protecting the land from conversion to non-forest uses.” Priority is given to lands that possess important scenic, cultural, and recreation resources. The FLP, first created in 1990, is active in over 22 States. As of November 2001, approximately 113 projects covering 209,000 acres have been completed, involving a contribution from the FLP of about \$50 million (<http://www.fs.fed.us/cooperativeforestry/flp.htm>).

The Federal Farmland Protection Program (FPP) was established in the 1996 FAIR Act to provide funding to State, non-government organizations (NGOs), local

governments, and tribal entities that have existing farmland protection programs (<http://www.info.usda.gov/nrcs/fpcp/fpp.htm>). The FPP provides up to 50 percent of the fair market value of the conservation easement on privately owned farmland. Funded in several waves since its inception, as of December 2001 the FPP had spent approximately \$50 million to protect about 107,000 acres of land (on about 540 farms) that have a total easement value of about \$190 million. The 2002 Farm Security and Rural Investment Act (the Farm Bill) greatly expands funding for the FPP, allocating approximately \$100 million per year over the next 6 years for the program. (<http://www.nrcs.usda.gov/programs/farmland/2002/index.html>).

The Overall Demand for Farmland Protection

In this section, we consider what determines the overall level of government protection of agricultural lands. Taking a broad perspective, the advent and continuing popularity of farmland protection programs can be viewed as a logical response to the locally diminishing supply of farmland and, hence, of the rural amenities provided by farmland. Figure 6 illustrates this story. Consider an urban State and a rural State. In both States there is a market-driven amount of land devoted to farming (S^e_U and S^e_R), an acreage defined by those lands where agriculture represents the most profitable use. Essentially, these farm acres provide local residents with a quantity of rural amenities “for free.” Furthermore, assume that the next most profitable use of land is in a developed use.

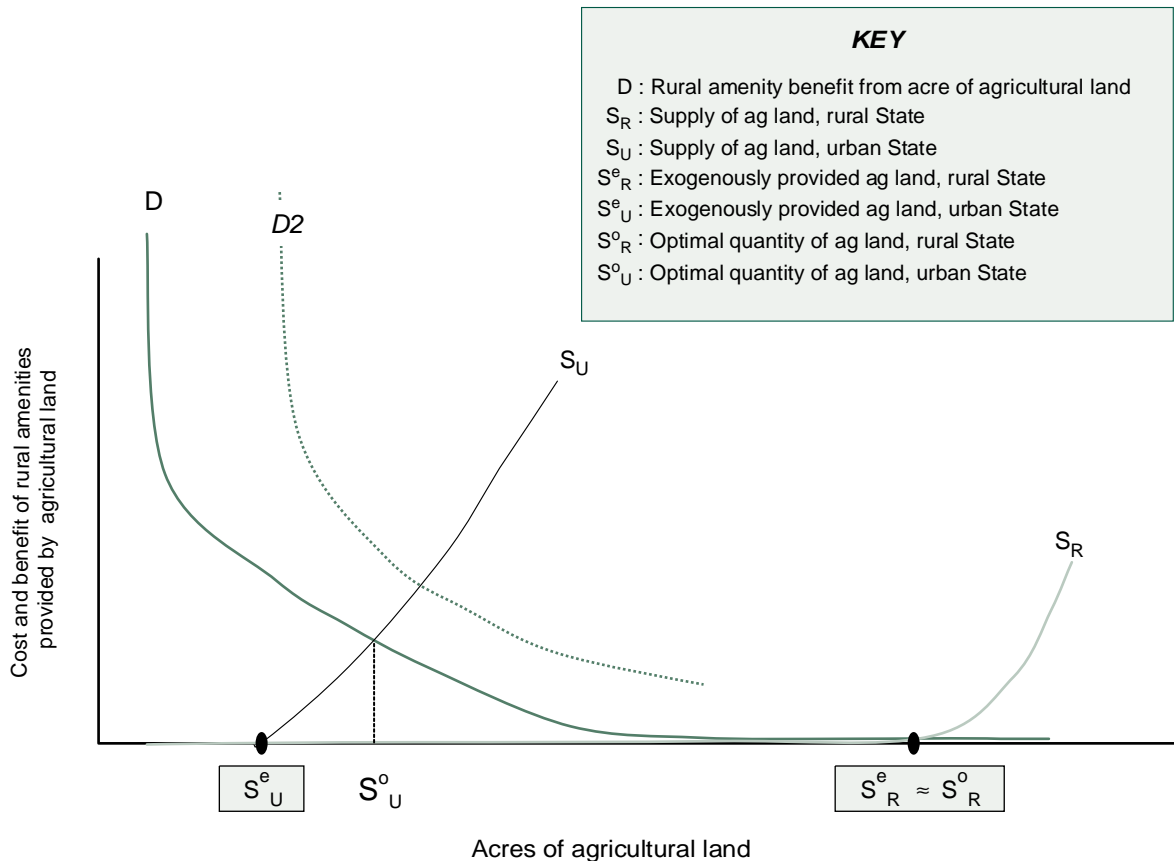
To induce profit-maximizing landowners to provide more than the market-determined acreage of agricultural land, farmland owners would require an additional infusion of money to compensate them for continuing to farm when it would otherwise be prof-

itable for them to develop. In the urban State, agricultural land is scarce, and there are many competing uses for farmland. Thus, the cost of providing more rural amenities (by providing an additional acre of farmland over and above the market-derived equilibrium) becomes non-zero at a relatively low acreage.¹⁴ In the rural State, farmland is abundant, hence the cost becomes non-zero at a large acreage. These differences are illustrated in the two supply curves: in the rural State, it is shifted to the right.

The optimal acreage of farmland is determined by where the demand curve for rural amenities intersects the respective supply curve. Here, curve D represents the aggregate demand for rural amenities. In the urban State, this intersection occurs at an acreage that is greater than the amount of agricultural land that is provided by the freely operating land market. Conversely, in the rural State, this intersection occurs at (or very near) the market-driven acreage. Essentially, residents of the rural State are satiated

¹⁴ The cost is the “additional compensation” required to induce a farmer to continue (or to increase) his farming.

Figure 6
The demand for farmland protection: Rural vs. urban states



with rural amenities, and have little desire to acquire more rural amenities than are provided by the normal workings of the land market.

In short, the high marginal value of rural amenities (a value due to scarcity) in the urban State means that people would be willing to pay a lot more to protect additional farmland than in the rural State. This stylized fact helps explain why we see more energetic farmland protection programs in urbanized parts of the Nation (such as the East). In fact, given the higher population densities of urban States, and given the public goods nature of many rural amenities, it is likely that the true urban demand will be shifted up (as represented by curve D2), which will further increase the divergence between urban and rural States.

It is not surprising that a diminishing supply of farmland is likely to lead to greater efforts to protect what remains. However, this may be just one of several factors that are important in determining a community's decision to engage in farmland protection. For example, one can postulate (as did Adelaja and Friedman) that wealthier communities have the necessary financial and social resources to afford farmland protection.

To shed some light on the underlying motivations for farmland protection, we developed an econometric model using data from several Eastern States (see Appendix 2 for details). The first part of the model considers influences on the decision to adopt PDR programs. The second part examines the amount of land preserved in a county given that the county has a PDR program.

Our findings support several hypotheses:

- ◆ “Wealthier communities will protect farmland.” This is supported by the importance of an income variable.
- ◆ “Protecting what farmland is left.” This is supported by the positive correlation between land preservation and population pressure, increases in population pressure, and reductions in quantity of farmland found in the model.
- ◆ “Availability of farmland.” This is supported by a positive relationship between remaining farmland and farmland preservation.

It is not surprising to find support for these hypotheses, since these factors are inter-related. As farmland is developed, the average income levels of a given county likely rise. These factors contribute to a demand for

farmland protection. At the same time, it is easier to protect farmland when much of it is available for preservation. All of these factors taken together help explain the existence and activity of these programs.

Yet what are the underlying reasons motivating the desire to protect farmland? That is, just what rural amenities and other non-market goods are being maintained? To try to discern the answer to this question, a more careful analysis of farmland protection programs is called for, one that goes beyond simple measures of whether a program exists, or what the size of a program may be.

Preferences for Rural Amenities

Because a single commodity known as “rural amenities” does not exist, effectively providing rural amenities is not as simple as determining how much farmland to protect. Farmland protection programs designed to maintain rural land uses differ in how they maintain the supply of the various goods (and services) that one may call rural amenities, with different programs affecting each of these goods in different ways.

It is not always obvious which rural amenities the public attempts to protect when they choose to preserve farmland and other rural open spaces through the legislative process.¹⁵ As noted earlier, activities focused on preserving farmland, and other rural lands, protect a *bundle* of nonmarket goods associated with rural uses of land. What are the most important attributes in this bundle? Is it visual landscape aesthetics, less congestion on rural roads, supporting local growers, or something else? Should efforts to preserve farmland focus on preservation of the economic activity called farming or only on the preservation of the open space associated with uncluttered (and, perhaps, even agriculturally idle) rural land?

One approach is to ask people what they think farmland preservation programs should protect. Table 1 summarizes the findings of a number of such studies. Although most of this work has dealt with the question of how much farmland to protect, rather than the reasons for protecting farmland, several studies have addressed the questions of the relative value people place on different rural amenities.

¹⁵ Along with rural amenities, the public may also be interested in goals such as food security and the control of sprawl.

Table 1—Summary of several surveys on public attitudes toward farmland protection

Authors	Region	Findings
Halstead (1984)	Hampden County, MA	There are strong preferences for protecting remnant farmlands, that increase with size of program, and seem to be positively influenced by the proximity to farms.
Furuseth (1987)	Mecklenberg County, NC	There is broad support for farmland protection; farmland heritage, environmental reasons, and protection of future food supply were important reasons.
Variyam et al. (1990)	National	Support for a variety of agricultural programs suggests that preservation of family farms is important, but respondent self-interest also influences support for agricultural policies.
Dillman and Bergstrom (1991)	Greenville County, SC	Positive, though small, benefits to protection of farmland, with the benefits of such protection stated as being limited to changes in rural amenities. The low values are attributed to the large amount of agriculture in the study region.
Kline and Wichelns (1994, 1996)	Rhode Island, Pennsylvania	Environmental reasons are most important, followed by local food concerns, preservation of rural communities, and slowing development.
Bowker and Didychuk (1994)	New Brunswick, Canada	Willingness to pay for farmland protection is correlated with membership in environmental organizations and “visiting the land” and is negatively correlated with distance to farmland.
Ready et al. (1997)	Kentucky	Positive difference between survey-derived compensating variation measures and house-price/wage-rate hedonic measures of the value of protecting horse farms suggests that these farms have an existence value.
Rosenberger and Walsh (1997)	Routt County, CO	Protection of ranchland yields small overall per acre values. These values may be substantially larger if preferences of summer visitors are considered.
McLeod et al. (1999)	Sublette County, WY	Residents prefer continued agriculture on some lands, and wildlife/recreational uses on others, with development never a preference.
Krieger (1999)	Chicago suburbs	The support for rural land protection (which includes farmland protection) seems to be derived from quality of life concerns, especially those related to sprawl reduction. Compared with other rural land protection programs, the most important reasons stated for supporting farm protection were protecting family farms and maintaining food supplies.
Boyle et al. (2001)	Several States	Focus groups suggest that the public favors protection of family farms, protecting land with water on it, and favoring land with active farming.
Duke et al. (2002)	Delaware	Delawareans seem to be most concerned with keeping farming as a way of life, having access to locally grown agricultural commodities, protecting water quality, and preserving rural character.

In several studies on preferences for farmland preservation goals in Rhode Island, Kline and Wichelns found that protecting water and wildlife were most important, followed by local food concerns, maintenance of farming and rural communities, and slowing development. Protection of farmland for purely agricultural reasons was important, but not a prime concern.

Krieger found that protection of farmland around Chicago was important, with farmland preservation being commensurate with more traditional concerns (such as schools and crime reduction) in terms of budget priorities. The support seems to derive from quality-of-life concerns, especially those related to sprawl reduction. Farmland and other types of open space were viewed as roughly equivalent in terms of their ability to maintain quality of life. Protection of family farms and maintaining food supplies (i.e., characteristics uniquely provided by farmland) were recognized as the most important reasons for preserving farmland, while protection of wildlife and recreational needs (amenities not unique to farmland) were seen as better served by other programs.

Recent work by Boyle et al. examined how a variety of farmland attributes influence public support for farmland preservation. Using focus groups in several different States (Ohio, Georgia, Colorado, Oregon, and Maine), individuals were asked to comment on photographs and verbal descriptions of various rural parcels, and were presented with a draft survey that offered choices between different farmland preservation programs. While the results are preliminary, and are based on small convenience samples, several factors seem to stand out in importance. These include preferences for the protection of family farms, protecting land with water on it, and favoring land with active farming (as opposed to abandoned lands, clearcuts, and other signs of overuse or neglect).

Pfeffer and Lapping (1995) found that preservation of important forms of conventional agricultural production like dairy farming is not what non-farm residents wish to conserve. Exactly what type of farm production they would encourage via PDR is unclear, and is probably unclear to the public. Earlier work, using results from a focus group analysis of planners found no consensus among planners in the group about whether the central goal of PDR and TDR programs

was to maintain farming or simply to protect open space (Pfeffer and Lapping, 1994).¹⁶

These studies suggest that the public has a variety of reasons for protecting farmland, ranging from environmental concerns to protection of family farms to protection of food supplies. No single reason seems to dominate, though some reasons may be most important in select regions (e.g., environmental concerns in Rhode Island). This implies that preserving amenities uniquely associated with farmland may not be a dominant preference nationwide.

Abstracting from the actual findings of these few studies, these types of "stated preference" studies may suffer from a number of potential biases and are difficult to validate. One alternative is to examine people's willingness to pay for open space in the vicinity of their homes, as evidenced by differences in housing prices. A recent study by Irwin and Bockstael uses parcel-level sales data on suburban and exurban houses in Maryland, and tests the effect of various types of open space on housing prices. Their findings suggest that people are willing to pay more to live near lands that are privately held but protected from development—for example, conservation easement lands—than lands that are either developable (but currently unimproved) or lands that are publicly owned open space. While not definitive evidence of people's preferences for particular rural

¹⁶ Given their interactions with various segments of the local population and their task of developing plans that reflect local interests, planners should provide valid information about local expectations. Pfeffer and Lapping note that:

"The protection of open space is another environmental concern that may oppose *farmland* preservation. For those that value the protection of open space more than agriculture, farming is seen more as a means to an end than as an end in itself."

They quote one of their focus group participants:

"When farms get to the point where they are concerned about farmland protection, it's at a point where farming is really not a viable way of life. There's the last few farms in town, and it's too late. I think we have to make a distinction between farmland protection for the sake of agriculture and open space protection, and that's where a lot of towns start to push to protect farmlands. Where it's scenic qualities and other environmental attributes as opposed to wanting it to be there for agricultural purposes and, in fact, we'll often have situations where towns will move to protect the farm, and then try to prevent it from being used as a farm."

amenities associated with farmland, and while applying only to those living in proximity to farmland, this study suggests that people have differing values for different types of open space.

Another alternative strategy is to consider the intent behind implementation of actual rural land preservation programs. Since these require a commitment of resources (albeit social resources, rather than individual resources), closer investigation of rural land preservation programs may reveal the actual prefer-

ences of the public.¹⁷ Also, the translation of the laws into practice—that is, how preservation agencies design the programs that preserve land—may suggest the relative importance of particular amenities. The next chapter presents our investigation, which takes a close look at State and local programs.

¹⁷ The examination of why people vote for or against public programs has also been used to highlight the relative importance of public expenditures (Kahn and Matsuka).

Analysis of Farmland Protection Programs

Given that government programs reflect (albeit imperfectly) public preferences, the details of farmland protection programs presumably reflect the relative importance of a variety of rural amenities. With the goal of learning more about which rural amenities matter, we analyzed several strands of evidence related to government programs designed to protect rural lands. In this chapter, we discuss our review of the enabling legislation of State-level agricultural lands protection programs, and a comparative analysis of ranking criteria used in several State and local agricultural PDR programs; we also present a set of in-depth case studies of the suite of land preservation programs employed by several States.

Review of enabling legislation:

The enabling legislation of many programs often contains statements relating to purpose. By examining the language of a broad set of programs related to agricultural land preservation, one may discern the motivations of the legislators, and, presumably, the preferences of the citizenry.

Comparative analysis of ranking criteria:

Once adopted, most agricultural PDR (and TDR) programs face annual budget constraints requiring them to pick from among a set of candidate land parcels. Formal criteria are frequently used to rank parcels, criteria that explicitly weight the various attributes of each parcel. To the extent that these attributes can be correlated with specific rural amenities, such ranking schemes offer a direct measure of the value of different rural amenities.

Case studies:

Agricultural land is one of several rural land types that provide amenities. Thus, neglecting to consider the size and emphasis of other rural land protection policies can yield a misleading picture of the overall importance of the various rural amenities. To account for this complexity, the agricultural land protection programs of several States are studied in greater depth, and are placed within the context of other programs that protect rural land.

Throughout this analysis, one should keep in mind several factors that may limit the accuracy with which legislation reflects popular preferences:

- ◆ Enactment of farmland protection legislation is sensitive both to the demand for rural amenities and to the supply of rural lands. That is, as discussed earlier, in regions where farmland is abundant, there is less need for legislation devoted to farmland protection, even if the population of these regions has a high demand for their rural amenities.
- ◆ Adoption and implementation of farmland protection programs is subject to all the vagaries of the political process, including the possibility that some interest groups are over-represented relative to the preferences of the general public (Appendix 2).
- ◆ Similarly, institutional factors, such as adoption of features of a neighboring State's program as a legislative shortcut, may obscure the true preferences of the public (Appendix 2).

The latter two points are of particular interest, for they may lead our analysis to conclusions that have little to do with the underlying preferences of the citizens of the State. However, these programs represent real commitment of taxpayer funds, commitments that have often been reaffirmed over more than 20 years of budget allocations. Hence, the impetus driving the adoption of farmland preservation programs is not likely to be a mere fluke of politics.

National Analysis: A Review of Enabling Legislation

One source of information on the demand for individual components of rural amenities is the text of the legislation enacted by States to establish their farmland protection laws and programs. As part of the legislative process, and sometimes according to legal mandate, legislation proposed in most State legislatures includes a prefatory section of text, specifically referred to as a "purpose clause" or "findings clause." These are official statements of the legislature that describe the intent or goals of the legislation. Thus, the language (text) of legislation, especially that found in purpose clauses, often identifies the specific outputs that the public hopes to protect.

The Legislative Process

By definition, laws, and thus the phrasing of the purpose clauses, are the outcomes of a political

process. In fact, the intent of the legislature in enacting a statute always controls its meaning. Judges, attorneys, historians, and others, study intent for guidance in interpreting statutes. Courts have developed, and legislatures have enacted, elaborate sets of rules governing statutory construction, including, in some cases, the incorporation of purpose clauses. These rules are designed to help courts ascertain a legislature's intent. Though the concept of legislative intent encompasses much more than purpose or findings clauses,¹⁸ courts look first to the statutory language. Only when the ordinary rules of statutory construction fail adequately to elucidate the legislature's intent, do courts and attorneys turn to other indicators of legislative intent.¹⁹

In other words, legislative intent is an expression of public preferences and is revealed in statutory language. Therefore, public law may contain evidence as to what goods and services (such as rural amenities) citizens strive to protect when their legislature institutes farmland protection programs.

The Data

The American Farmland Trust (AFT) has collected sections of State code that pertain to farmland protection laws. These include laws that establish agricultural districts, agricultural protection zoning, comprehensive growth management, conservation easements (such as PDRs and TDRs), differential assessment, and right to farm.²⁰ Using AFT's online links (<http://www.farmlandinfo.org/>), we reviewed the purpose and findings clauses embedded in these sets of State code to identify key phrases that refer to specific

¹⁸ Legislative intent, also referred to as legislative history or legislative purpose, can be loosely defined as the documents that contain the information considered by the legislature prior to reaching its decision to enact a law (Jacobstein and Mersky).

¹⁹ "Studying the background and events that led to a bill's passage, as well as the social, economic, and political climate of the period may also be helpful in determining legislative intent." (New York State Library: <http://www.nysl.nysed.gov/legint.htm>). See Adelaja and Friedman (1999) for an application.

²⁰ When analyzing these laws, we did not include legislation that enables the "concept" of purchase of conservation easements. These laws (variants of which are found in nearly all States) were enacted merely to remove historical common law impediments to the acquisition of partial interests; they do not appropriate funding for any particular easement program.

²¹ For some States, Maryland for example, AFT does not provide the law, or an appropriate link. In these cases, State sources for codes are available.

rural amenities.²¹ The initial step was to review the laws collected by AFT pertaining to farmland preservation in the 48 contiguous States (as summarized in table 2a). This process yielded a large number of "catch phrases," many of which appeared to be synonyms for an underlying core set of outputs.

To synthesize this information, each phrase was categorized on the basis of an identified output. Based on our literature review (described earlier), and on our reading of the enabling legislation, we developed a list of five broad categories: "orderly development," "food security," "local economy," "environmental services," and "protection of rural amenities." The fifth category (protection of rural amenities) is then subdivided into four sub-categories.

Results

These five categories (and four sub-categories) are shown in table 2b (with States sorted into USDA's 10 Farm Production Regions). An "X" indicates that at least one of a State's farmland protection laws mentioned that output.²² From this perspective, the "protection of rural amenities" category is mentioned most often (by 36 States), including all of the Northeast, Lake, Appalachian, and Pacific States. "Orderly development" is mentioned by only 18 States.

Table 2b clearly shows that the Northeast, Lake, and Pacific regions place emphasis upon almost all of the outputs. In fact, with one exception, all three States in the Pacific region mention all five categories. Local food security has broad appeal and is emphasized in 30 State codes; only three of these States also mention national food security (Appendix 3, appendix table 3.2). In contrast, "orderly development" is hardly mentioned in the Northern Plains, Appalachian, Southeast, Delta, Southern Plains, and Mountain regions. And, with the exception of Appalachian, those same regions hardly mention the "local economy" as a category.

It is instructive to examine the subcategories within "protection of rural amenities" (the right-hand side of table 2b). The amenities sub-categories mentioned most frequently are "rural/agrarian character and

²² We also created a weighted classification that assigned higher scores when the legislation contained more language about a given amenity. Since the conclusions were essentially the same, and since our scoring mechanism was highly subjective, we present our results using this simpler "YES/NO" type of scoring.

Table 2a—Types of farmland protection programs adopted, by State

Region	State	Agricultural districts	Agricultural protection zoning	Differential assessment	PACE (PDR)	Right-to-farm	Transfer of development rights
Northeast	Connecticut			X	X	X	X
	Delaware	X		X	X	X	
	Maine			X	X	X	
	Maryland	X	X	X	X	X	X
	Massachusetts	X		X	X	X	X
	New Hampshire			X	X	X	
	New Jersey	X		X	X	X	X
	New York	X		X	X	X	X
	Pennsylvania	X	X	X	X	X	X
	Rhode Island			X	X	X	
Vermont			X	X	X	X	
Lake States	Michigan		X		X	X	
	Minnesota	X	X	X		X	X
	Wisconsin		X	X	X	X	
Corn Belt	Illinois	X	X	X		X	
	Indiana		X	X		X	
	Iowa	X	X	X		X	
	Missouri			X		X	
	Ohio	X	X	X	X	X	
Northern Plains	Kansas		X	X		X	
	Nebraska		X	X		X	
	North Dakota		X	X		X	
	South Dakota		X	X		X	
Appalachia	Kentucky	X		X	X	X	
	North Carolina	X		X	x*	X	
	Tennessee	X		X		X	
	Virginia	X	X	X	x*	X	
	West Virginia			X		X	
Southeast	Alabama			X		X	
	Florida		X	X	X	X	X
	Georgia			X		X	
	South Carolina			X		X	
Delta States	Arkansas			X		X	
	Louisiana			X		X	
	Mississippi			X		X	
Southern Plains	Oklahoma			X		X	
	Texas			X		X	
Mountain	Arizona			X		X	
	Colorado		X	X	X	X	X
	Idaho		X	X		X	X
	Montana		X	X	x*	X	X
	Nevada			X		X	
	New Mexico			X		X	
	Utah	X	X	X	x*	X	X
	Wyoming		X	X		X	
Pacific	Alaska			X		X	
	California	X	X	X	X	X	X
	Hawaii		X	X		X	
	Oregon		X	X		X	
	Washington		X	X	X	X	X

x* indicates Purchase of Agricultural Conservation Easements (PACE) or Purchase of Development Rights (PDR) programs in plenary stage.
 Source: AFT 1997, updated March 2002.

Table 2b—Legislative intent of farmland preservation programs

Key to columns:

- 1 DEV: Orderly development
- 2 FSEC: Food security
- 3 ECON: Local economy
- 4 ENV: Environmental services
- (5) AMEN: Protection of rural amenities.

The rural amenities are:

- 5.1 (OS): Open space
- 5.2 (CHAR): Rural/agrarian character and active agriculture
- 5.3 (HAB): Wildlife habitat/natural area
- 5.4 (SCEN): Aesthetics, scenic beauty

An "X" indicates that at least one of a State's farmland protection laws mentioned the output described in the column heading.

		1 DEV	2 FSEC	3 ECON	4 ENV	5 AMEN	5.1 OS	5.2 CHAR	5.3 HAB	5.4 SCEN
Northeast	Connecticut		X	X	X	X	X	X	X	X
	Delaware		X	X	X	X	X	X	X	X
	Maine	X	X	X	X	X	X	X	X	X
	Maryland	X	X	X	X	X	X	X	X	X
	Massachusetts		X		X	X	X	X	X	X
	New Hampshire				X	X	X	X	X	X
	New Jersey	X	X	X	X	X	X	X	X	X
	New York		X	X	X	X	X	X		X
	Pennsylvania	X	X	X	X	X	X	X		X
	Rhode Island	X	X	X	X	X	X	X	X	
Vermont	X	X	X	X	X	X	X	X	X	
Lake States	Michigan	X	X	X		X	X			
	Minnesota	X	X	X	X	X	X	X		X
	Wisconsin	X		X	X	X	X			X
Corn Belt	Illinois	X	X	X	X	X	X	X	X	X
	Indiana		X							
	Iowa	X	X	X		X	X	X	X	X
	Missouri	X		X	X	X	X	X		X
	Ohio			X	X	X	X	X	X	X
Northern Plains	Kansas		X							
	Nebraska	X			X	X	X	X		
	North Dakota									
	South Dakota		X							
Appalachians	Kentucky		X	X	X	X	X	X	X	X
	North Carolina		X	X	X	X		X		
	Tennessee	X		X	X	X	X	X	X	X
	Virginia		X	X	X	X	X		X	X
	West Virginia		X			X		X		X
Southeast	Alabama									
	Florida					X		X	X	X
	Georgia		X		X	X		X	X	
	South Carolina		X							
Delta States	Arkansas		X		X	X	X		X	
	Louisiana			X	X	X	X	X		X
	Mississippi									
Southern Plains	Oklahoma									
	Texas		X							
Mountain	Arizona		X			X	X	X	X	X
	Colorado		X		X	X	X	X	X	X
	Idaho									
	Montana	X			X	X	X	X	X	X
	Nevada					X				X
	New Mexico									
	Utah					X	X	X	X	X
Wyoming										
Pacific	California	X	X		X	X	X	X	X	X
	Oregon	X	X	X	X	X	X	X		X
	Washington	X	X	X	X	X	X	X	X	X
48 States		18	30	23	29	36	31	31	24	30

active agriculture,” “open space,” and “aesthetics, including scenic beauty” (31, 31, and 30 mentions, respectively). The “wildlife habitat/natural area” was mentioned less often (24 times).²³

Overall, although the review of the purpose and findings clauses in State codes suggests that a broad, underlying core of outputs is widely sought by citizens across the United States, it appears that protection of a range of rural amenities through farmland protection programs is primarily a concern of the most densely populated States. Less densely populated States and regions express concern about fewer amenities. Nonetheless, various rural amenity subcategories still have broad appeal (especially “rural/agrarian character,” with 31 mentions).

However, some reasons mentioned in most States are hardly mentioned in the sparsely populated Northern and Southern Plains, perhaps indicating such an abundance of these outputs that their mention in farm preservation legislation is not warranted (in some States, almost no farmland preservation programs have been enacted). Predictably, protecting “rurality”—the agricultural community/economy and nonagricultural development—is not of primary concern in the vast, less densely populated areas of the United States, with their extensive agricultural lands and public open spaces.

These findings, that the public cares about a broad set of outputs that include a number of rural amenities, roughly agree with the findings of the literature (as summarized earlier). There is a widely prevalent concern with maintaining active agriculture, coupled with concern for rural amenities that are less dependent on active agriculture (such as maintaining “open space” and “scenic beauty”). Although suggestive, this “analysis through classification” is rather coarse. A closer look at the workings of individual programs may reveal more about the finer details of just which rural amenities matter most.

In-Depth Analysis: Focus on the Northeast

To ascertain public preferences for rural amenities, a more detailed and a broader look at farmland protection programs may yield insights beyond those gathered from our analysis of enabling legislation. In this section we consider both approaches. To better focus the analysis,

²³ We also created an expanded (17 categories) list, displayed in Appendix 4. Although the expanded list presents a more nuanced picture, the general conclusions do not change.

we limit our attention to five Northeastern States, chosen largely because they have active portfolios of State and county programs aimed at preserving rural amenities, both through farmland protection and other rural land programs. In addition, as summarized in table 3, these five States are leaders in their use of agricultural PDR and TDR programs. We believe these programs to be a primary indicator of intensity of demand for rural amenities provided by farmland, from which we can discern information about the public’s interest in individual components of the rural amenities bundle.²⁴

This Northeastern focus is not meant to suggest that other regions of the country are not interested in farmland protection. For example, Colorado has a large and growing rural land (including farmland) protection program. California, while it does not have a State-run agricultural PDR program,²⁵ was an early adopter of differential assessment (the Williamson Act of 1965). Oregon, as exemplified by Portland’s urban growth boundary, is also active.

Of course, the Northeastern States we focus on may not be fully representative of the Nation. It can be argued that the Northeast is uniquely different, as reflected in settlement patterns and population demographics,²⁶ as well as in ecological, geophysical, and climatic attributes. These differences might mean that residents of the Northeast have preferences that are systematically different from the rest of the Nation.

Nevertheless, in general the Northeastern States have several decades of experience with a broad set of programs, hence are most conducive to our analysis. In addition, these five States have seen both a substantial decrease in agricultural lands and a large increase in urban lands (see figure 7). In many ways, the Northeast may be a bellwether for other rapidly growing regions.

²⁴ These five States are representative of the rate at which prime farmland is developed—and slowing the rate of land conversions provides an impetus for farmland preservation. NRI data reveal that between 1992 and 1997, these States ranked between 6th (Pennsylvania), and 49th (Vermont) in terms of average annual rates of conversion of prime farmland (<http://www.nhq.nrcs.usda.gov/land/tables/t5853.html>).

²⁵ The California Farmland Conservation Program, authorized in FY2000 with a budget of \$25 million, provides grants to local governments, non-profits, conservation districts, and other organizations whose stated purpose includes conservation of farmland (<http://www.consrv.ca.gov/dlrp/CFCP/index.html>).

²⁶ Such as the greater importance of older, more densely populated, city centers.

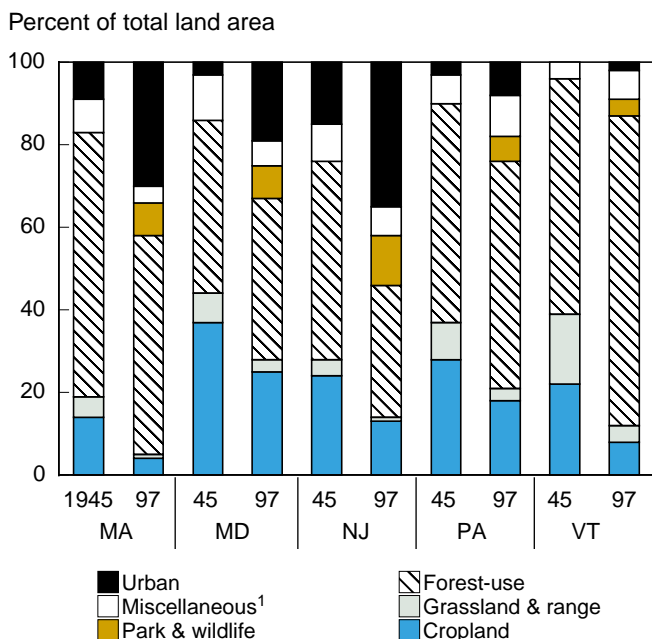
We start by examining the ranking criteria of several State and local agricultural PDR programs in several Northeastern States. These criteria can highlight the importance of various rural amenities, and how this

Table 3—Agricultural PDR acres protected¹

State	Acres protected (rounded to 1,000)	Funds spent to date	Easements/ restrictions
	<i>Acres</i>	<i>Million dollars</i>	<i>Easements</i>
Maryland	186,000	232	1,303
Pennsylvania	186,000	377	1,527
Vermont	88,000	44	278
New Jersey	71,000	197	483
Massachusetts	48,000	117	527
Delaware	61,000	61	273
Connecticut	27,000	79	197
7-State total	667,000	\$1,107	4,588
19-State total	806,300	\$1,210	4,898
Including local (county) totals	997,000	\$1,743	6,247

¹ This table displays three measures of acres protected, as of fall 2001, by the top seven (out of 19) State-level PDR programs. Except for the last row, these numbers exclude acres protected through county-level programs.
Source: American Farmland Trust.
(http://www.farmlandinfo.org/fic/tas/PACE_State_2002-1-23.PDF)

Figure 7
Land change, by selected States, 1945 to 1997



¹Transportation, industrial, residential, marshes, deserts, and other unclassified rural lands.

Source: Vesterby, M., and K.S. Krupa (2001). "Major Land Uses." (Database 1945-97) <http://www.ers.usda.gov/data/majorlanduses>.

importance can vary across States. Second, we take a broad look at the land use policies of these five States through case studies, where we consider both farmland and non-farmland programs. We conclude this section with a set of lessons learned.

Analysis of Ranking Criteria Used in PDR Programs

By permanently restricting development of agricultural lands, agricultural PDR programs contribute to the protection of rural amenities. Government agencies administering PDR programs cannot directly control the type of agricultural activity that occurs on preserved lands (because an easement restricts non-agricultural uses without inhibiting landowners' other rights to use the land). However, through its program design, the government can influence the likelihood that certain lands—along with their accompanying amenities—in particular areas will be preserved.

Governments exert their preferences through the use of ranking mechanisms to prioritize applications for easements. The ranking is often used to determine the order of the offers to purchase easements if the PDR program is oversubscribed, to limit the number of applications that will be considered, or to establish the easement value. Agencies administering PDR programs likely prioritize their easement purchases based on which are likely to yield the greatest benefits for citizens within the jurisdiction. Therefore, the ranking mechanisms can implicitly reveal information about the combined effect of the relative scarcity of particular farmland attributes and the preferences the public has over these attributes.²⁷ In this section, we take a closer look at the ranking mechanisms and what they reveal about the variations in preferences for preserving rural amenities in different counties and States.

Overview

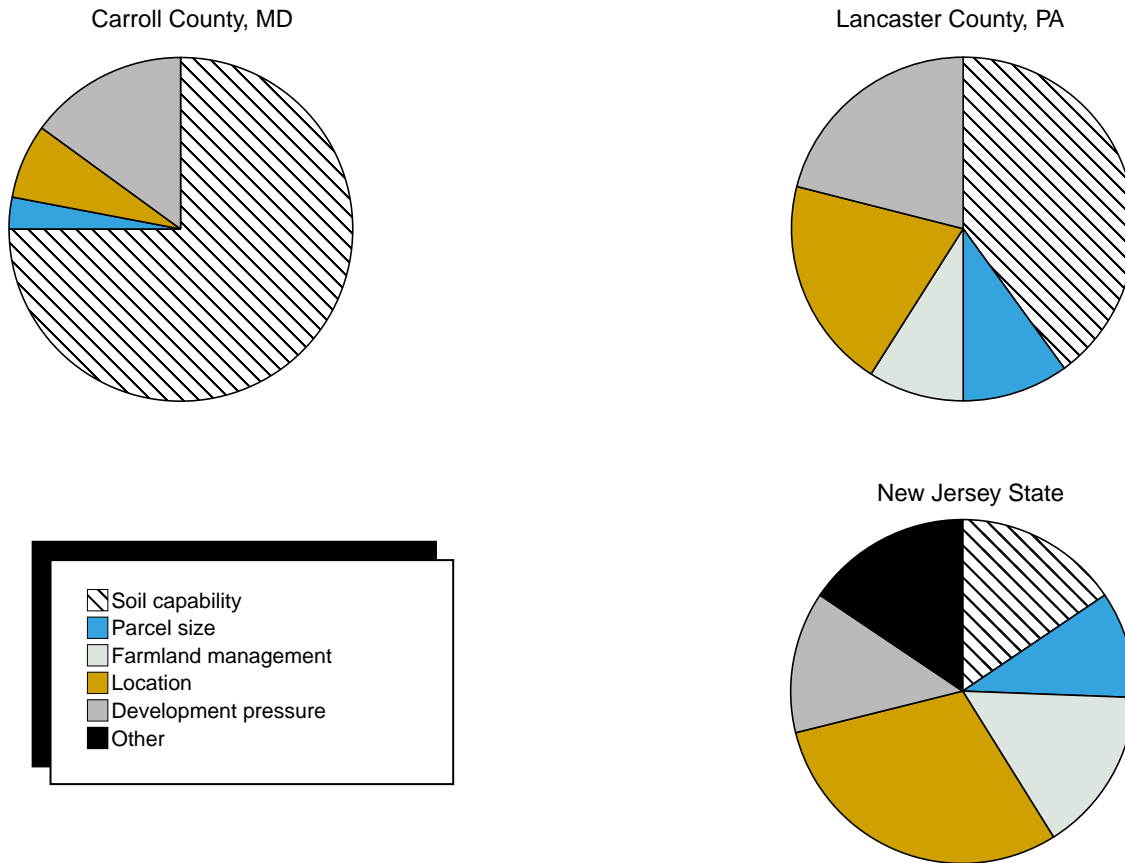
Figure 8 depicts the relative weights placed on various categories by several agricultural PDR programs. Appendix 4 contains a detailed table that shows, for these and several other (State and county) programs, more explicit factors used to rank a parcel. The appendix also includes a table listing the minimum eligibility criteria to sell easements in these programs.

²⁷ Since participation in PDR programs is voluntary, the preservation outcomes will depend on which landowners choose to participate. However, Nickerson finds evidence that ranking criteria do influence what lands are ultimately preserved.

Figure 8

Examples of agricultural PDR ranking criteria

Proportion of total points allocated to broad categories of land characteristics



Note: PDR programs often prioritize applications by ranking them based on which parcels have the most desired set of land characteristics. The about pie charts illuminate how a few of these programs vary in their preferences for particular characteristics.

In Maryland’s State agricultural PDR program, participating counties have sole discretion in developing their ranking criteria; in Pennsylvania, counties can allocate points to factors within State-mandated ranges. In New Jersey, the State and counties purchase easements (the State will buy easements or fund 80 percent of the cost for counties to do so), but many counties voluntarily follow the State’s ranking criteria. In Massachusetts and Vermont, the factors considered in the ranking are not awarded points per se, but are described in order of importance.

Importance of Soil Quality

Soil quality tends to be the most important parcel characteristic, typically accounting for nearly half of the allocated points (with a range varying between 9 percent and 75 percent of allocated points). Common to all the programs is a preference for preserving

parcels with the highest soil quality. Although soil quality itself is not an explicit preference for a particular type of farming, higher quality soils are typically used for row crops.²⁸

Although soil quality is an important factor, exceptions are often allowed. For example, the Maryland State agricultural PDR program allows counties to relax minimum soil standards if the land is used for specialized production such as dairying, poultry production, orchards, and vineyards. However, Maryland counties differ in which types of farms are awarded points. If soils are poorer quality, Caroline County will award

²⁸ In some programs, a preference for high soil quality is coupled with a preference for row cropping operations. In others, row cropping operations are not necessarily favored. For example, Caroline County’s (MD) ranking is unique in that it awards as many points for productive woodland as it does productive cropland.

points if a significant portion of the farm is devoted to specialized use or non-food production such as horses. Conversely, Carroll County's program specifically does not relax its standards for horse farms because they do not contribute to the production of food and fiber and tend to be raised as a hobby rather than as a "valid" agricultural operation there (Carroll County Commissioners 1999—Agricultural Preservation Ordinance 99-9). Taking a different tack, Massachusetts considers soil quality, but also targets preserving different types of farms—a requirement that serves to prevent concentration of all protected lands in the portion of the State with the best soils (the Connecticut River Valley).²⁹

Unique Contribution to Agricultural Community

Several programs also rank higher parcels that contribute significantly to the local agricultural economy. In particular, Maryland's State Rural Legacy program and Vermont give these parcels high priority. Whether this preference results in the protection of rural amenities or "disamenities" will depend on which facilities are preserved and where they are located. For example, in Howard County (MD), parcels with important regional grain processing facilities are prioritized for preservation. These facilities may be an important factor in maintaining the viability of agriculture in the county (and thereby help to preserve the overall flow of rural amenities to the county's citizens); but they may be considered a disamenity to non-farmers living near them.

Preserving Larger Farms and Blocks of Farms

All programs reveal a preference for preserving larger farms, but the emphasis placed on preserving the largest farms, relative to other parcel characteristics, varies widely across programs. In the Massachusetts program, parcels as small as five acres can be enrolled and parcel size is a third priority in its ranking scheme. In the Maryland State agricultural PDR program, even though parcels must be at least 100 acres to qualify for easement sale, the emphasis on large parcels can be quite different. For example, Caroline County awards 22 percent of points to parcels of at least 175 acres, but Carroll County allocates only 3 percent of points to 200-acre farms.

²⁹ Source: personal communication, Richard Hubbard, Massachusetts Department of Food and Agriculture.

Some programs appear to place a greater emphasis on preserving blocks of contiguous parcels instead of large individual parcels. Of the PDR programs reviewed here, those in New Jersey place the greatest emphasis on preserving contiguous blocks of farmland, with 18-20 percent of total points allocated to this category compared with 5-9 percent for individually large parcels. In some programs, like those in Carroll County (MD) and Luzerne County (PA), being within 0.5-2.0 miles of preserved farms is sufficient to earn a higher rank. The Montgomery County (MD) program is notable for its emphasis on preserving parcels within 0.5 mile of the suburban edge of the agricultural zone, rather than prioritizing preserving clusters within the agricultural zone. Howard County (MD) does not emphasize contiguity, perhaps because the county is approaching build-out, little undeveloped land remains, and agricultural preservation occurs in zoning districts that allow a substantial amount of development.

Location of Preserved Farms and Amenities Relative to Populated Areas

Even though the public does not enjoy the right of public access to preserved farmland, people may derive value from viewing the rural amenities associated with preserved farmland, particularly when preservation areas are relatively close to developed areas. Most of the programs target preserving farm parcels that face development pressure but are located in agricultural or rural areas that are consistent with local land use plans. Of the programs reviewed, anywhere from 10 percent (in PA counties) to about 30 percent (in Montgomery County, MD) of total points are allocated to indicators of development pressure, with the maximum number of points earned by parcels facing the greatest pressure. An exception is Cecil County (MD) which targets purchasing easements on parcels where the threat of conversion to non-agricultural uses is low. Several programs target parcels with road frontage, with two counties—Montgomery and Howard Counties (MD)—allocating the greatest number of points to this criterion (approximately 15 percent and 9 percent of points, respectively). Similarly, Vermont seeks to preserve parcels with road frontage because such an approach "provides scenic vistas to the travelling public."³⁰

³⁰ Source: VHCB undated document titled "Grant of Development Rights, Conservation Restrictions, Contingent Right of the United States of America and Right of First Refusal."

Recently, Maryland has increased its efforts to concentrate easement purchases in particular areas. As part of recently enacted smart growth legislation, it implemented the Rural Legacy program which targets land preservation efforts on very specific blocks of land in several areas around the State.

Effect of Purchasing Easements at Least Cost

Even though the ranking schemes may prioritize relatively contiguous blocks of farmland and the most productive agricultural soils, several State agricultural PDR programs will ultimately prioritize purchasing easements at the least cost. That is, they will offer to purchase easements at the landowner's bid price if it is less than the estimated easement value. Although this strategy allows a State government to preserve more land with limited funding, it is more difficult to target the types (and location) of amenities that are preserved along with farm parcels. Idiosyncratic characteristics of landowners (that induce them to offer to sell the easement at a discount) may significantly affect the prioritization of farm parcels and hence the preservation of their accompanying amenities.

Two years ago Maryland allowed counties to choose whether the State would use least-cost criteria as the means for prioritizing easement purchases in their county, or the county-determined ranking scheme. At least seven of 18 participating counties have chosen to adopt the county ranking as the means for prioritization. This change gives these local governments more ability to target the types of amenities that are preserved.

Some programs cap the amount the State or county will pay per acre (e.g., at \$2,500/acre in Luzerne County, PA; \$10,000/acre in Massachusetts; and \$975/acre in Vermont). In these jurisdictions, preservation may occur where the payment cap does not deter landowners from preserving their land; for example, in somewhat more rural areas, and on parcels more removed from development.

Summary

A comparison of the criteria used to rank easement applications suggests that although similarities exist in the parcel characteristics that various State and local governments seek to preserve through farmland preservation programs, there are also notable differences. There is no "one-size-fits-all" program. Preferences

for the accompanying rural amenities that are preserved, therefore, differ across these jurisdictions.

For example, all of the programs prioritize preserving land with soils that are considered the most productive for row crops, but programs differ in the types of specific farming operations (specialized production, non-food operations such as horse farms) that are ranked higher. Also, some programs prioritize preserving contiguous parcels while others prioritize large, individual parcels. While this suggests that preserving large blocks of farmland is important, buying easements first on parcels that are the least costly may lead to a scattered pattern of preservation. Nevertheless, in a study using data on preserved and unpreserved farm parcels in Maryland, Nickerson found evidence that such programs can and do result in the preservation of relatively clustered parcels. Preserving the largest individual farms appears to be less important than protecting the most productive land in almost all of the programs reviewed here.³¹

Of the ranking criteria reviewed here, the emphasis on preserving productive soils and row cropping operations suggests the largest preference is for preserving "traditional" cropland and livestock operations.³² If program administrators are concerned with long-term farm viability, they may seek to preserve lands that are most likely to be profitable to farm for the foreseeable future. To the extent that highly productive soils³³ guarantee long-term profitability, and to the extent that the rural amenities flowing from farms with these soils is equivalent (or superior) to the rural amenities produced by farms with lower quality soils, it is sensible to give highest priority to preserving farms with the most productive soils.

³¹ Using data on the actual parcels preserved in several Maryland programs, Lynch and Musser found evidence of the tradeoffs that program administrators make in achieving various program goals. They found that when purchasing easements at least cost is a program goal, the program is less likely to preserve as desirable a set of characteristics relating to soil quality, threat of development, and contiguity of preserved farms. They also found evidence suggesting that farm size and soil quality carry greater weight than proximity to urban centers and clustering of preserved farms.

³² Maryland's new Rural Legacy Program couples preserving farm parcels with important natural resources (wildlife habitat, etc.). This additional preservation effort suggests that preferences for, and benefits from, preserving other amenities that are not uniquely associated with farmland are increasing in that State.

³³ This argument also applies to factors such as "row cropping" and "agricultural infrastructure" that may indicate farm profitability.

Lastly, as noted earlier, the public supports farmland protection for “environmental” reasons in addition to protecting family farms and the food supply. No single reason appeared dominant in those studies, although respondents in certain regions favored certain reasons over others (e.g., environmental concerns predominated in Rhode Island). Our analysis of a limited set of PDR ranking schemes suggests that the rankings emphasize preserving amenities that are uniquely associated with actively farmed agricultural lands—which, relative to pastureland or forestland, may exacerbate environmental problems due to increased runoff from fertilizers and topsoil. However, these programs also require farmers to adopt water quality and soil conservation plans as a condition for easement sale, or give higher rank to applications with such plans in place (appendix table 4.2). Thus, the design of the programs is not necessarily inconsistent with preferences for environmental protection.

In the next section, we consider the broader set of rural land protection programs in these five States.

Case Studies of Several State Programs

The rural landscape, from which rural amenities derive, is shaped by policies applied by a variety of governmental bodies. Farmland preservation and other rural land-use policies are largely the prerogative of State and local governments.³⁴ Land use policy in each State has developed incrementally over time, often as a patchwork of laws. In addition, some laws that are important determinants of land use are not even considered “land-use” laws—their land-use impacts were not considered, or were considered to be secondary.

As a consequence, the number and combination of land-use policy instruments vary dramatically across States, with no States having identical arrays of laws. For example almost all States have implemented some form of use-value assessment, legislated right-to-farm laws, and designated State parks (AFT). Some States, such as North Dakota, have essentially no other laws that could be classified as land-use, farmland protection, or rural amenity protection laws. A few have complex arrays of laws that influence landowner decisions concerning land use through an interaction of

policies emanating from all levels of government (and nongovernment organizations, as well). Figure 9 provides a schematic to illustrate the complex system of programs and participants that influence rural land-use decisions.

The existence of these arrays of policy, complex or otherwise, means that the interpretation of demands for rural amenities provided by agricultural land must occur within the context of programs that act as substitutes or complements to farmland preservation programs. These include programs that protect parks, natural resource areas, and other areas that provide either direct public access or visual open space.

To put our analysis in perspective, our case studies of State land-use policies in five Northeastern States is designed to describe how the mosaic of programs and policies (implemented at various policy levels) forms a network that helps explain the focus of a State’s farmland protection programs. In particular, the overall purpose is to better understand which non-market amenities society was attempting to preserve (by saving land from urban-related development) when it implemented various rural land use programs. For instance, what can we learn concerning the relative emphasis farmland preservation programs place on preserving scenic landscapes, as compared to the emphasis on compact growth, or as compared to open space preservation?

Overview

It is useful to delineate four policy entities that are largely responsible for shaping the rural landscape and the supply and location of rural amenities in the United States: Federal Government, State government, local (city, county and township) governments, and private land trusts. Each of these policy entities takes individual policy actions that focus largely upon one of four sets of policy goals that influence the provision of rural amenities: open-space protection, farmland protection, compact urban growth, and other, less direct actions that nevertheless have direct implications for the rural landscape and rural amenities.³⁵

³⁴ The Federal Government has played a large role with respect to national parks, forests, and rangelands, but, as discussed in the box on pp 10-11, only a minor recent role with respect to farmland preservation.

³⁵ Some programs, such as Maryland’s Rural Legacy Program, have explicit goals of linking both other programs and the effects of those programs, attempting to achieve an aggregate effect that could not be achieved as the sum of the other programs.

Open-space protection:

Preservation of parks and playgrounds that permit public access.

Farmland protection:

Actions intended to preserve local agricultural activity, including both farmland and farmers.

Compact urban growth:

Encouragement of “smart growth” and other policies that, by targeting infrastructure investments to existing or planned urban areas, remove incentives to convert farm or open-space land to nonagricultural uses.

Other policies:

Policies such as water and air quality programs, tax structure, and transportation mode and siting decisions are also instrumental in determining land use, though often the impacts are unintended.

Our case studies encompass all four of these policy approaches. We consider State, local, and private initiatives. However, the analysis and discussion are weighted toward State policies that affect farmland protection and open-space protection, because it is with respect to these two issues that most policy action has taken place. Compact urban growth policies, for instance, are relatively new attempts at conserving rural lands and amenities, and only a few States have suites of laws that implement this approach.

To begin, one might examine the commonality among the State farmland preservation portfolios. As illustrated in table 4, all five States utilize programs involving differential assessment, agricultural conservation easements, and right-to-farm laws. Maryland, New Jersey, and Pennsylvania incorporate agricultural district programs into their portfolios. Further, all of the States’ preservation efforts are supplemented by TDR programs operated at a local level.

Summary of Maryland Case Study³⁶

Maryland encompasses nearly 8 million acres of land and surface water, including more than 6 million acres of land. Nearly 90 percent of the State’s 5.3 million people live within the Baltimore-Washington metropolitan area, and only about 7 percent live in nonmetro

areas.³⁷ In 1997, about 35 percent of its land was in farms, and the average farm size was 178 acres (9th smallest of the United States). In 1999, farming provided \$720 million (0.4 percent) in gross value added to the gross State product. The top five agricultural commodities in terms of the State’s total farm receipts in 2000 were: broilers (31 percent), greenhouse/nursery (18 percent), dairy (12 percent), soybeans (6 percent), and corn (5 percent). Maryland is also home to the Chesapeake Bay. The annual value of tourism and commercial activity related to the bay exceeds \$31 billion (http://www.dnr.state.md.us/rurallegacy/pos/pos_101.html). The forest products industry is the fifth largest industry in the State, and is the primary employer in western Maryland.

Until the 1960s, providing publicly accessible forestlands dominated the focus of government efforts to protect rural amenities. Efforts to acquire additional land for recreation and publicly accessible open space use followed in 1969, with citizen support for imposing a real estate transfer tax to fund the purchase of State parklands as well as the purchase and development of local parks and playgrounds through Program Open Space. The State also formed the Maryland Environmental Trust (MET), a public nonprofit organization, to accept donations of conservation easements. The MET’s goals include protecting farmland, forestland, wildlife habitat, waterfront, unique or rare areas, and historic sites. Thus the focus on the types of land, and rights to access, differ. Since the types of rural amenities likely to be preserved differ, these programs are not considered to be close substitutes with farmland preservation programs.

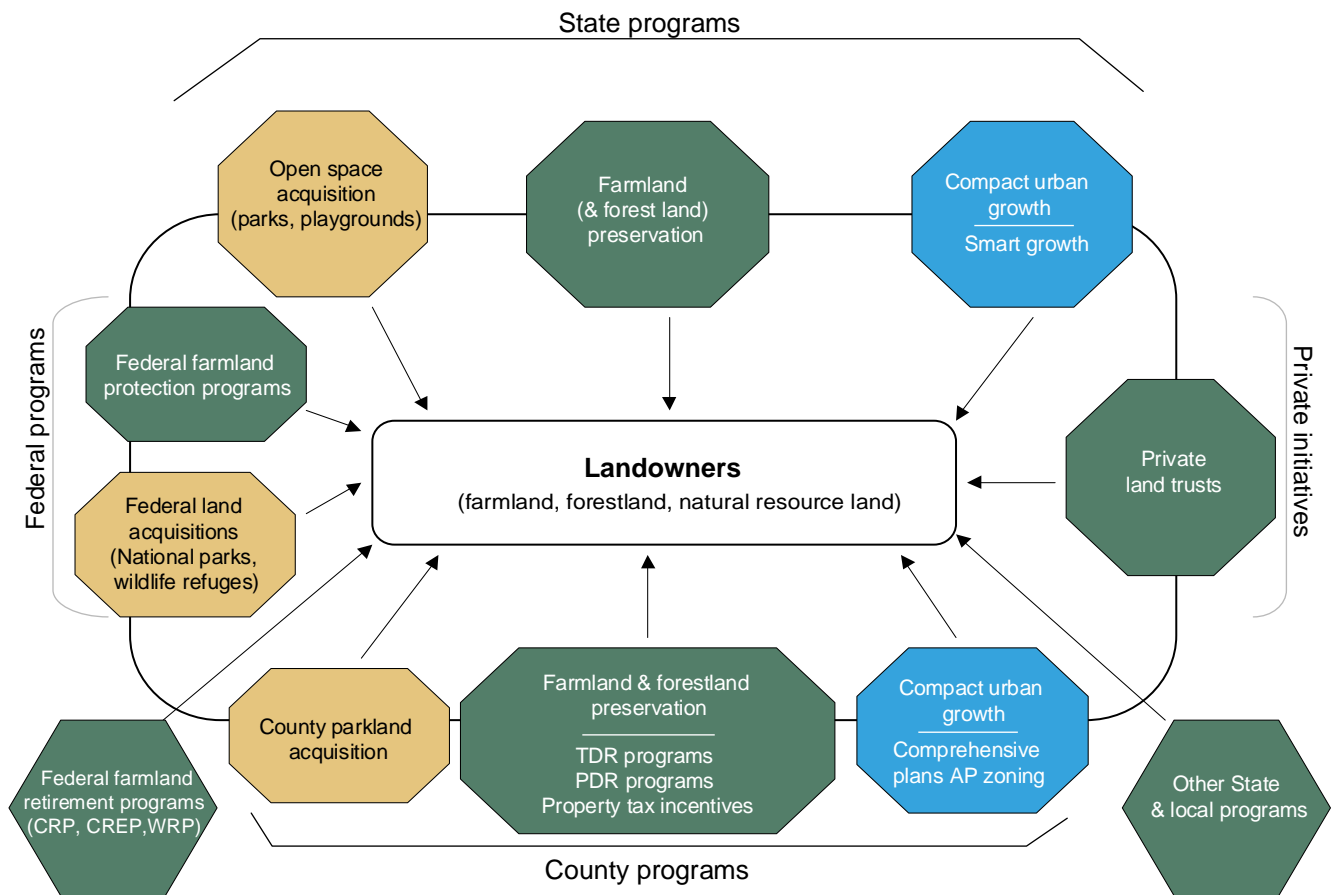
Maryland’s State-level efforts to preserve farmland have evolved since the early 1960s in response to growth pressures that were leading to rapid conversions of agricultural land. In the 1987–97 period alone, Maryland lost 17 percent of its farms, and about 13 percent of its 2.4 million acres of farmland (MDA 1999). Preservation efforts began with the adoption of differential tax assessment and a recapture of the tax break when farmland is converted. In response to continuing declines in the supply of farmland and given that farmland preservation was one of several competing goals in the MET’s mission, the State implemented its agricultural PDR program in 1978.

³⁶ The full case studies can be found in <http://www.ers.usda.gov/Briefing/LandUse/>

³⁷ Metropolitan areas are defined as populations of 50,000 or more people and the outlying suburbs. For more information see <http://www.ers.usda.gov/Briefing/Rural/Data/Metro.html>.

Figure 9

Rural land conservation: Programs and participants



Programs that influence use and disposition of private lands:

- Blue boxes indicate regulatory programs.
- Green boxes indicate voluntary-participation programs
- Gold boxes indicate programs involving outright sale of the land

Table 4—Farmland protection tools of five Northeastern States

State	Agricultural districts	Agricultural zoning	Differential assessment	PACE (PDR)	Right-to-farm	TDR	Growth management
Maryland	S, L	L	S	S, L	S	L	S
Massachusetts	S		S	S	S	L	
New Jersey	S		S	S, L	S	L	L
Pennsylvania	S	L	S	S, L	S	L	
Vermont			S	S	S	L	

S = State; L = local.
 Source: AFT, *Saving Farmland*.

Through this program, easements on both farmland and forestland are acquired.

Some counties have four or more alternatives for preserving productive farmland, including TDR, a county-initiated agricultural PDR, MET, a State-funded land preservation fund (MALPF), and Rural Legacy PDR programs. In addition, over 40 land trusts operate and focus their operations within a single county. Although there is some substitutability between farm preservation programs (such as MET, MALPF, and the various county programs), the goals differ between at least some of the programs. The State and county farmland preservation programs seek to preserve a local viable agricultural industry (in addition to providing open space), while MET does not share this emphasis. Across counties, the goals and the patterns of preservation can differ markedly, with some counties emphasizing preservation in relatively condensed clusters while others allow preservation to occur on parcels interspersed with development. Several local land trusts act to speed the timing of preservation but otherwise complement existing government agricultural PDR programs.

State-level farmland preservation efforts have recently evolved to focus on permanently protecting a wider variety of resources in larger, more contiguous tracts of land through its Rural Legacy Program. One of the goals of this new program, which was established in 1998, is to systematically link new protected open space with existing State, county, and local park systems and with other existing protected environmental areas to create adjoining networks of ecologically important land. The Rural Legacy Program was implemented as part of the State's "smart growth" legislation, which acts to preserve all undeveloped lands by limiting State funding for infrastructure projects to existing neighborhoods and to planned growth areas.

In 1997, about 19 percent of the State was developed and about 8 percent of non-urban lands were protected, publicly owned open space. In addition, about 192,000 acres (3 percent of the State) were owned or protected by county and municipal programs.³⁸ Through 2001, the State agricultural PDR program had preserved 186,000 acres (0.04 acre per capita) at a cost of \$232 million (AFT 2002). Also as

³⁸ Data on land owned and protected by county and municipalities were derived by ERS from 1997 NRI data, <http://www.nhq.nrcs.usda.gov/NRI>

of 2001, the MET had protected over 85,000 acres. As of January 2002, over 14,000 acres had been preserved through the Rural Legacy Program.

Summary of Massachusetts Case Study

Massachusetts covers 5.0 million acres, and only 2 percent of its 6.3 million residents live in nonmetropolitan areas (<http://www.ers.usda.gov/StateFacts/MA.HTM>). Massachusetts has steadily been losing farmland throughout the 20th century, with about 20 percent of its agricultural land lost since the 1970s. In 1997, the State had about 500,000 acres (10 percent of land area) in farms, and the Nation's 3rd smallest average farm size—93 acres. The greenhouse/nursery industry and the dairy industry accounted for nearly 50 percent of the State's farm receipts in 2000, contributing 34 percent and 14 percent, respectively.

Although farming provides a very small percentage—0.1 percent (\$222 million) in 1999—in gross value added to the gross State product, the rate of farmland loss has prompted a number of responses at the State and local level. For agricultural lands, two measures are primarily used as protection tools: differential tax assessment, and a purchase of development rights which is known locally as the Agricultural Preservation Restriction (APR) program. Both of these were implemented in the late 1970s, with differential tax assessment now applied to about 250,000 acres, and the APR program protecting about 47,000 acres (about 10 percent of Massachusetts farmland).³⁹

The Massachusetts agricultural PDR program (the APR program) is notable in its lack of a strong set of formal rules for determining what offers to accept. Nevertheless, it appears that agricultural viability is the most important criterion, with less weight given to other environmental and open space concerns. PDR grants are also broadly distributed, with almost a third of Massachusetts cities and townships having some PDR lands.⁴⁰

In 1997, about 30 percent of the State was developed and about 8 percent of non-urban lands (0.06 acre per capita) were protected, publicly owned open space. In addition, about 309,000 acres (6 percent of the State)

³⁹ Source: Mass Department of Food and Agriculture.

⁴⁰ In Massachusetts, counties supply a relatively limited set of governmental functions. Hence, local land use programs typically are undertaken by cities and townships, or by regional authorities (such as the Boston area Metropolitan District Commission).

were owned or protected by county and municipal programs. The State agricultural PDR program had protected about 47,000 acres (about 0.01 acre per capita) at a cost of \$117 million through 2001 (AFT 2002). Massachusetts has preserved the least amount of land per capita of the five States reviewed here. In addition, a widespread network of private land trusts protects about 150,000 acres of mostly non-farmland—about three times as much land as farmland preserved through the State’s PDR program.⁴¹ Recently, the State Department of Fisheries and Wildlife began purchasing easements on land both to limit development and to provide public access.

Summary of New Jersey Case Study

With 8 million people living on 4.7 million acres of land, New Jersey is the most densely populated State in the Nation. It is sufficiently dense that the entire State falls within metropolitan areas. It also has more roads per square mile than any other State, and has lost more than half of its farmland since the 1950s. As of 1997, about 800,000 acres were in farms, and the State had the Nation’s second smallest average farm size at 91 acres. New Jersey ranks in the top three States for blueberry and cranberry production. The greenhouse/nursery industry contributes the greatest percentage of the State’s total farm receipts (36 percent), followed by blueberries, dairy, chicken eggs, and peaches (4 percent, 4 percent, 3 percent, and 3 percent, respectively). However, farming contributed only 0.1 percent in value added to gross State product in 1999.

Since 1961, voters have approved nine bond issues and preserved 870 thousand acres of open space. As a general guideline, New Jersey seeks to meet the following open space goals: 3 percent of “developed and developable acres” at the municipal level, 7 percent at the county level, 10 percent at the State level, and 4 percent at the Federal level.

The preservation of open space and the provision of rural amenities in New Jersey was substantially increased with the 1999 passage of the Garden State Preservation Trust Act. This Act dedicates \$98 million per year for 10 years, with a goal of preserving 1 million additional acres of open space. Its three basic programs are open space preservation, farmland preservation, and historic preservation, with 56 percent, 38 percent, and 6 percent of funding allocated

to the programs, respectively. The primary goal of the open space program is to provide opportunities for active and passive recreation. Secondary goals are to reduce sprawl and congestion, and to protect environmental quality (particularly water quality). The focus of the farmland preservation program is to preserve agricultural viability. The Garden State Preservation Trust Act’s stated ethic is “*Places to play, clean water resources, wildlife habitat, and farm fresh food to eat.*”

New Jersey also is home to the Pinelands area, which represents the largest block of open space in the mid-Atlantic. The Pinelands contains a huge reservoir of very pure water. The Pinelands is highly valued as an aesthetic and recreational asset for the State, and the region is rich in both Native American and colonial history. The aesthetic, recreational and historic amenities contribute both to the quality of life in New Jersey and to a healthy tourism industry. In 1978 Congress created the 1.1-million-acre Pinelands National Reserve. About a third of the Pinelands area is now publicly owned. Development is heavily restricted in the core of the Pinelands (the Preservation Area), and development pressure is channeled into existing urban areas on the fringes of the Pinelands (called Regional Growth Areas). To compensate landowners for the loss of development rights, the State established the Pinelands Development Credit program in 1985. This is a standard TDR program whereby Pinelands landowners are given development credits which they can sell on the open market to developers, who can increase development density in the Regional Growth Areas.

In 1997, about 36 percent of the State was developed, and about 12 percent of non-urban lands was protected, publicly owned open space. Approximately 870,000 acres (0.09 acre per capita) were protected through State open space programs. In addition, about 294,000 acres (6 percent of the State) were owned or protected by county and municipal programs. As of 2001, about 71,000 acres (0.01 acres per capita) were protected through the State’s agricultural PDR program at a cost of \$197 million (AFT 2002). As of 1998, private land trusts had protected over 90,000 acres in New Jersey. Of these 90,000 acres, more than 60,000 had been transferred to government agencies.

Summary of Pennsylvania Case Study

Pennsylvania’s population of over 12.2 million persons resides on a land area of nearly 29 million acres. About 15 percent of the population live in nonmetro-

⁴¹ Source: Jennifer Steel, Massachusetts Audubon Society.

politan areas. Roughly 25 percent (7.2 million acres) of the State's area is farmland, of which 5 million, or 70 percent is classified as cropland. In 1997 the State had the 7th smallest average farm size at 158 acres. The top five commodities in terms of total State farm receipts in 2000 were: dairy (37 percent), cattle and calves (9 percent), mushrooms/agaricus (10 percent), greenhouse/nursery (7 percent), and chicken eggs (7 percent). In 1999, farm gross value added comprised only 0.5 percent of gross State product.

In 1895, the State began purchasing lands for State Forest Reservations, some parts of which later became State parks. The focus of early efforts was preservation and protection of rare, scenic, historic, and natural areas. Often, the initial impetus for park formation was to provide health benefits (fresh-air cure of tuberculosis)⁴² and motorist camping sites. Around 1955, parks became a major priority, with a goal of creating a State park within 25 miles of every citizen. By 2000, 116 parks had been created, encompassing 277,000 acres. The State also has 2.1 million acres in State forestlands.

The slowing of park development that occurred near 1970 signaled a shift toward a farmland preservation focus. In 1974, Pennsylvania's "Clean and Green" law instituted use-value assessment of farmland. Agricultural district laws were put in place in 1981, followed by right-to-farm legislation in 1982. Then, the agricultural district law was amended in 1988 to more clearly define an "agricultural security area" and to create a joint county-State conservation easement purchase program.

The State-level Pennsylvania Farmland Preservation Program purchases development rights (easements) from owners of farmland. Since its creation in 1989 (and the dedication of a portion of cigarette tax revenues in 1993), the program has protected over 1,400 farms and 186,000 acres, at a cost of approximately \$2,000 per acre. Individual counties also provide funding in some cases. The Purchase of Agricultural Conservation Easements legislation suggests that the program is aimed at limiting urban sprawl, protecting productive farmland and maintaining farming as a viable economic activity.

⁴² Source: "Pennsylvania State Parks—The Early Years" <http://www.dcnr.state.pa.us/stateparks/history/historyearlyyears.html>

Both the counties and the State share in the decision of which land parcels are accepted into the program. The State sets broad criteria for approval, which can be modified by the individual county. Counties submit applications for easement purchases to the State Agricultural Land Preservation Board for approval. The four primary criteria are:

1. Land Evaluation: Primarily based on soil productivity (weighting range: 40 percent–70 percent).
2. Development Potential: Measures the development pressure and is based on the extent of non-agricultural use in the area, zoning, amount of road frontage and proximity to public sewers and water services (weighting range: 10 percent–40 percent).
3. Farmland Potential: Measures agricultural amenities such as farm size, product sales, stewardship, scenic qualities, and land use (weighting range: 10 percent–40 percent).
4. Clustering Potential: Measures the ability of the land parcel to make up part of a larger non-developed area. Based on factors such as proximity to other farms with easements or applying for easements or percentage of land adjacent to the farm that is in an agricultural security area (weighting range: 10 percent–40 percent).

In 1997, about 7 percent of the State was developed, while about 6 percent of non-urban lands (0.13 acre per capita) were protected, publicly owned open space. In addition, about 481,000 acres (about 2 percent of the State) were owned or protected by counties and municipalities. Through 2001, the State had preserved about 186,000 acres (0.02 acre per capita) through its agricultural PDR program at a cost of \$377 million (AFT 2002). Approximately 70 land trusts are active in Pennsylvania and have preserved 348,000 acres. The Pennsylvania Land Trust Association coordinates efforts by individual land trusts.

Summary of Vermont Case Study

Vermont contains approximately 5.9 million acres of land with a population of approximately 600,000. Nearly 67 percent of these people live in non-metropolitan areas. As of 1997, about 1.3 million acres of this land was farmed. Since 1950, Vermont has lost 65 percent of its agricultural land base. That loss is of concern to Vermont citizens in part because of the large role that tourism plays in the State's economy.

Though Vermont's agriculture contributes just \$500 million in farm receipts annually to the State's economy and contributes about 1.6 percent to gross State product, it ranks third behind manufacturing and tourism. The scenic beauty of Vermont's agricultural landscape plays a key role in attracting tourists. In fact, Vermont is one of the few States to explicitly promote its agriculture as a tourist attraction, as exemplified by its "Vermont, a Farm Product" campaign. The dairy and cattle/calves industries contributed 74 percent and 10 percent of the State's total farm receipts, respectively, in 2000. At 217 acres, Vermont had the largest average farm size in 1997 of the five States comprising the case study, but had the 17th smallest farm size of all U.S. States.

The loss of farmland and open space has prompted the State, over several decades, to enact a portfolio of legislation to counter that trend. Early efforts to maintain rural land in agriculture included zoning and planning. Comprehensive growth management, differential assessment, and right-to-farm laws followed these efforts. The differential assessment law in particular, mentioned the "maintenance of Vermont's productive agricultural and forest land...prevent[ing] accelerated conversion...preservation and enhancement of Vermont's scenic natural resources...and ...orderly growth." In a similar vein, the right-to-farm legislation mentions agricultural lands as "unique and irreplaceable" resources contributing to the State's economy, "preserv[ing] the landscape and environmental resources," and "increas[ing] tourism." The Vermont Housing and Conservation Board (VHCB) was created with authority to fund purchase of conservation easements on farmland, forestland, and other undeveloped land. The VHCB does not buy easements itself, but channels funds to State agencies, municipalities, and nonprofit land trusts, which leverage the VHCB matching funds through landowner donations, private donation, or other public funds.

The VHCB was established to administer the Vermont Housing and Conservation Trust, whose objectives include not just the "retention of agricultural land for agricultural use," but also the protection of wildlife habitat, natural areas, historic properties, and outdoor public recreational activity. A unique element of the Vermont program is the explicit balancing of land preservation with its potential effects on the cost of housing, including a goal of "the preservation, rehabil-

itation or development of residential dwellings units which are affordable to low-income citizens." Agricultural lands conserved must be "actively farmed" and must contribute to existence of "a viable farm unit." In ranking farmland conservation projects, the VHCB gives highest priority to parcels with larger amounts of prime land with potential for diversified agricultural use, followed by high likelihood of continued farming, threat of development, and contribution to the protection of already preserved farms. Farms with appropriate farm-related structures, existing investments in soil and water conservation, and sound resource management practices receive the next levels of priority, as indicators of long-term agricultural viability and landowner commitment.

In addition to farmland, VHCB provides funds to protect lands that provide wildlife habitat and important natural features to support biological diversity, rare, threatened, or endangered communities, plants, or wildlife, or unusual and important geographical features. Availability of public access, once the area is protected, receives highest priority when ranking such lands. The State also attempts to accomplish the legislatively mandated mission to fund "activities which will encourage or assist ... the protection of areas suited for outdoor public recreational activities."

In 1997, about 2 percent of the State was developed and about 4 percent of non-urban lands were protected, publicly owned open space. In addition, about 101,000 acres (about 2 percent of the State) were owned or protected by counties and municipalities.⁴³ As of 2001, about 88,000 acres (0.14 acre per capita) were protected through the State's agricultural PDR program at a cost of \$44 million (AFT 2002). Vermont has preserved the most acres per capita in its State open space (0.79 acre) and farmland preservation (0.14 acre) programs of the five States reviewed here. The Vermont Land Trust, a private conservation organization, has helped protect about 50,000 acres of farmland and about 50,000 acres of natural areas with scenic, recreational, and historic values (Woods et al. 2000).

⁴³ More recent data from the University of Vermont's Conserved Lands Database (<http://snr.uvm.edu/sal/vtcons.html>) indicates that, as of April 2000, approximately 297,000 acres of private land were protected by conservation easement. This substantial increase, which is partially driven by a few large acquisitions of forest land, suggests the growing importance of rural land preservation in Vermont. <http://www.vlt.org/publications.html>

Lessons Learned

The review of ranking criteria and the case studies of land use policies are suggestive of which rural amenities matter, even though what matters cannot always be easily discerned. They also indicate that farmland preservation exists within a broader context of rural land preservation programs, such as programs dedicated to forestland preservation, maintaining open space, and protection of unique ecosystems. However, farmland has a unique role, a role that we summarize in the following findings:

Lesson 1: Though agricultural viability is the focus of farmland protection programs, that goal tells us little about the underlying amenities preferred.

It is clear that an important goal of nearly all farmland protection programs is to enhance or maintain the long-term viability of urban-edge agriculture. It is less clear why these laws are so intent on preserving agricultural viability specific to their localities. For example, agricultural districts, differential assessment, right-to-farm, and purchase of development rights all might be considered as programs that individually and collectively contribute to the maintenance of a “viable” local agriculture. The benefits farms receive from participation in these programs contribute to the overall profitability of these farms and thus increase their viability. While these laws, however, can reasonably be considered to contribute to the length of time that agriculture remains viable, they do not tell us much about “why” the public wants agriculture to remain viable. In other words, the “clear purpose” of these laws does not tell us much about which rural amenities (or other outputs) are most important. In a sense, they may simply be stating the necessary conditions (that farms stay in business) for the provision of agriculturally related amenities.

Are there provisions within these laws, though, that indicate an attempt by policymakers to maintain particular rural amenities, rather than simply to maintain the viability of active agriculture? Though one cannot unequivocally discern which individual public goods the public seeks, some information can be garnered by eligibility and program participation requirements, requirements that can be interpreted as evidence of proactive measures taken by legislatures to enhance or maintain specific amenities. For example:

- ◆ Many agricultural district and PDR programs give priority to farms using best management practices or require participants to adopt conservation plans. These requirements seem to be clear evidence of legislative intent to enhance or maintain water quality, especially given that such requirements do not contribute to agricultural viability.⁴⁴
- ◆ It is doubtful that legislators, and program administrators, would include significant rules regarding farm size, soil quality, or annual farm income as requirements if the intent was only to slow or prevent development (i.e., maintain open space) rather than to maintain active agriculture. An aesthetic such as that generated by a farm landscape can be achieved only by maintenance of active farming; open space, however, can be provided by a variety of undeveloped land types. Such rules imply a desire to maintain agricultural-specific amenities.
- ◆ If local food security were a primary concern, program dollars could be targeted to producers of edible farm products and withheld from such farm enterprises as horticultural crops and riding stables. In reality, laws in most of the five States studied specifically include such enterprises. These enterprises, however, may contribute to the critical mass of farms necessary to maintain the viability of many farm support businesses.
- ◆ In Maryland, woodland as well as farmland is protected through agricultural districts and the State’s PDR program. Although this implies that rural amenities provided by nonagricultural lands are sought for protection, one of the main reasons for including woodland was to facilitate preservation in counties where the forest product industry is important.
- ◆ In many States with an agricultural district program, landowners file a petition to form an agricultural district. Given that the formation of these districts is voluntary, it follows that the geographic distribution of lands in these districts will be determined at least partly by the characteristics of the landowners. Implementation under this arrangement does not especially enhance wildlife, which most biologists believe is protected most effectively by large, contiguous blocks of land linked by undeveloped corridors.

⁴⁴ One can argue that these practices are important for enhancing and protecting long-term agricultural viability. While this may be true, the more immediate impacts are generally off-farm (viz., reduced sedimentation in rural waterways).

◆ Agricultural district requirements that the land be “actively devoted to agricultural use” at the time of petition have implications for the amenities sought. This requirement would not be consistent with a desire simply for open space (in the sense of no development and no public access) since an “open space” amenity could be obtained without an “agricultural use” provision.

Overall, farmland protection programs are oriented toward preserving outputs related to agriculture, and are most attentive to rural amenities that are associated with active cropland. Other rural amenities are also important, especially when they can be provided simultaneously with active agriculture.

Lesson 2: Critical mass and the spatial pattern of permanent protection are often cited.

Underlying all of these programs is the premise that for active farming to remain viable in the long-term, a “critical mass” of farms and farmland must be maintained so that the farm support infrastructure (input suppliers and markets) can remain economically viable.⁴⁵ The concern is that loss of local farm support businesses will increase the cost of farm operations, inevitably reducing the viability of active local farming. If sufficient land can be protected, under conditions that are perceived to provide long-term preservation, then another detrimental effect of urbanization on the local farm industry can be reversed, namely the “impermanence syndrome.”

Although all State agricultural PDR programs articulate this goal, it is less clear that actual program designs assure that the lands are preserved in relatively close proximity. For instance, the Maryland program allocates money to easement purchases in many counties and relies on a “discount” ranking system for parcel selection. While this approach increases the number of acres that can be preserved for a given budget outlay, by design it distributes the acres preserved over a wide area—perhaps in a pattern that does not contribute to preserving land in close enough proximity to retain input suppliers. Programs that distribute funds geographically across jurisdictions using other means (such as observed in Massachusetts)

⁴⁵ Maryland and New Jersey explicitly mention this concern. For example, the Maryland agricultural district law lists its intention “to preserve the minimum number of acres in a given district that may promote the continued availability of agricultural suppliers and markets for agricultural goods.”

or those that put caps on per acre easement payments may suffer the same drawback.

In this regard, a combined use of downzoning and TDR programs has interesting characteristics. Though not often used and difficult to implement, these programs may effectively preserve much larger acreages. TDR programs are usually implemented in conjunction with downzoning, where large acreages are downzoned to low residential density levels similar to those achieved by agricultural PDR programs (even though the development rights may not have yet been sold by many landowners). Existing landowners in the downzoned area are granted TDRs based on pre-downzoning densities. When TDRs are then sold, the landowner is effectively compensated for land value that otherwise is lost due to the downzoning’s reduction in development potential of the land. Because the downzoning is applied to an entire “sending” area, TDRs have the potential for ultimately preserving relatively contiguous blocks of farmland.

Lesson 3: Permanent preservation does not mean no development of protected farmland.

Agricultural PDR programs in all States allow some level of residential development, but usually no commercial or industrial development. Such an outcome can have significant implications for the amenities that are preserved through these programs, such as the resulting “scenic views” and maintaining “cultural heritage.” Though the degree of residential development is usually rationalized and implemented as necessary for continuation of active farming (i.e., to allow farm operators and their families the ability to live on the farm and to ensure landowner participation), the effect can be low-density residential development similar to that achieved through large-lot zoning.

For example, “child lot” provisions enable owners of preserved farms to develop a limited number of lots as residences for their children. However, once the “child” lots are developed, there are few restrictions on transfers of the lots to nonfarm-related residents through sale or lease. In Maryland, for example, landowners selling development rights under the State’s primary farmland preservation program (MALPF) can reserve one lot (not to exceed 1 acre each) for each child, up to a maximum of 10 as long as the total does not exceed 1 lot per 20 acres. Housing may be constructed for tenants fully engaged in operation of the farm, but may not exceed one

tenant house per 100 acres. There is often a substantial economic incentive to develop many of these lots, despite clustering restrictions and other restrictions that attempt to prevent fragmentation of the landscape.

Almost since their inception, programs to purchase development rights programs have faced issues surrounding the conversion of preserved parcels to residential “estates.” Persons with sufficient wealth purchase selected preserved parcels, and then, using provisions permitting the presence of a landowner dwelling, have constructed “mansions.” Often, the farmland associated with the preserved parcel is no longer farmed by the new landowner, nor does the new landowner make the farmland available for rent to active farm operators. In essence, the new landowner obtains land for his large-lot “mansion” at agricultural use value and does not pay the “development value” that would be required to obtain a similar lot that had not been preserved. When this happens, it effectively precludes the land from ever being farmed again, since most farmers will not have sufficient financial capital to purchase land for farming with significant non-farm improvements to the house and landscape. In such cases, taxpayer money was used to retain land in large-lot residential uses.

A recent study that empirically compared the sales prices of preserved and unpreserved farms found no significant difference between them (Nickerson and Lynch 2000). The authors speculate that this finding, which was contrary to the expectation that preserved farms would sell for significantly less due to the restrictions on development potential, may be due in part to the purchase of some preserved lands by “hobby” farmers, who can afford to pay more than the agricultural income stream for the opportunity to live on a farm near an urban area.

Does the existence of this “loophole” mean that the public may not care too much about the “agricultural activity,” so long as open space is maintained? Or is agricultural use sufficient, even if practiced by individuals for whom farming is just a hobby? Or will this problem lead to the demise of PDR programs or a drastic restructuring of requirements? Though some PDR programs, such as Massachusetts, have taken steps to discourage some nonagricultural uses, the issue remains largely unresolved.

Lesson 4: The emphasis on high-quality cropland seen in most farmland protection programs seems

inconsistent with broader goals revealed in other analyses.

As evidenced by the above discussion of the five Northeastern States, the primary focus of farmland protection programs is to ensure the viability of an active agricultural industry in local communities. Implementation of this goal within many State and county PDR programs (as discussed earlier) is achieved by parcel ranking schemes or qualifying criteria that heavily favor high-quality cropland or (similarly) lands with the highest soil quality.⁴⁶ The premise underlying this strategy is that farms composed of high-quality farmland are the most likely to remain viable in the long term.⁴⁷

A question arises as to whether the bundle of rural amenities generated by the set of parcels preserved under this implementation strategy matches the public’s preferences for the rural amenity bundle. First, the characteristics of the parcels preserved under this strategy, and thus the bundle of rural amenities generated, will generally differ from the parcel characteristics and amenities derived from a strategy that preserves parcels representative of agriculture more generally—even if both strategies achieve the same goal of maintaining farm viability. Whether this is good or bad is an open question. However, evidence concerning public preferences gathered from other sources (as noted in section earlier) seems to indicate that in at least some parts of the country, the public may prefer a wider bundle of amenities. This bundle is less heavily weighted toward amenities derived from “active” agriculture and more heavily weighted toward open space (active agriculture is a sufficient but not necessary condition) and environmental services. This farm preservation strategy may be at least partially explained by the significance of agriculture in a particular State’s economy (see Lesson 6).

In addition to the survey evidence, the review of legislative purpose clauses seems to indicate that the public is

⁴⁶ As discussed in greater detail earlier, the State PDR program in Vermont does not use this strategy.

⁴⁷ An alternative hypothesis is that measures of agricultural productivity, or of soil quality, are predominant in farmland protection programs simply because they are readily available, and because they are technically and scientifically based and therefore defensible as an objective classification system. Thus, even though these measures may have little to do with societal goals, States and localities may use these measures rather than coming up with a classification scheme that could be subject to court challenges.

simultaneously interested in a broad array of rural amenities. While the amenities that are unique to an active agricultural industry are important, other amenities that depend less on “active agriculture” are also important. This is particularly so in States that have implemented the most intensive farmland protection portfolios. In other words, in many cases, legislative intent seems to be concerned with a broader set of rural amenities than indicated by program implementation.

The heavy emphasis on cropland has several implications for the “mix” of rural amenities that the set of preserved parcels will generate in aggregate. First, in most cases, fewer acres of cropland “open space” can be purchased with a given budget relative to grazing land or woodland “open space.”⁴⁸ Yet, both cropland and grazing or woodlands, provide equal amounts of “open space” in the sense that they equally contribute to an absence of development.

However, cropland often yields a less desirable set of environmental services than does grazing land or forested land. Soil erosion, chemical run-off, leaching of chemicals into groundwater, and flooding are more commonly associated with cropland than with either grazing land or forest land (Hanley). This distinction is important given the myriad of other governmental programs directed at improving the off-site environmental effects of crop production. With the heavy emphasis on the selection of cropland parcels that seem to work at cross-purposes with these programs, PDR programs often require soil conservation and water quality plans be implemented as a condition for participation.

A further consideration is the dissimilarity between the characteristics of the agriculture likely to be preserved through agricultural PDR programs and those targeted for preservation through most other farmland protection programs. The legislation enabling most other farmland protection programs sets goals of preserving the viability of the agricultural or farming industry or economy. The legislation then proceeds to define very

⁴⁸ Land used for crop production is typically cleared, level, and well drained. In contrast, grazing and woodland often have steep slopes, standing trees, and rocky soils. These limitations both reduce its cropland value and increase the cost of developing it. Consequently, the price that a preservation agency must pay to purchase the development rights to an acre of cropland will often be somewhat higher than the price for development rights to less productive farmland, *ceteris paribus*.

broad types of agricultural land uses or farm enterprises as qualifying for the programs. The legislation often defines agricultural land to include such diverse land uses as cropland, forest land, woodland, horticulture, silviculture, and aquaculture. For instance, Maryland’s agricultural district law states that “any farm use of land is permitted.” Massachusetts defines land in agricultural use as “when primarily used in raising animals, including . . . horses, bees, fur-bearing, for the purpose of selling such animals or a product derived from such animals; . . .” A parallel definition for horticultural use states “when primarily and directly used in raising fruits, vegetables, . . . flowers, sod, trees, nursery or greenhouse products, and ornamental plants and shrubs for the purpose of selling.” Agricultural development areas in New Jersey “may produce agricultural and horticultural products, trees and forest products, livestock, and poultry and commodities as described in SIC codes for agriculture, forestry, fishing, and trapping.” Pennsylvania adds “aquatic plants and animals.” This suggests that within the farmland preservation program portfolio, the characteristics preserved through various programs are not always close substitutes.

Lesson 5: Suites of farmland protection laws evolve over time.

Some variation exists with respect to the temporal pattern by which these programs were implemented, variation that may be a function of the anticipated interaction of the programs. All five States first employed the use of differential property tax assessment as a means of slowing conversion of agricultural land to developed uses. Maryland was the first State in the Nation to use this tool when it implemented its differential property tax assessment laws in 1956 (AFT 1997). Pennsylvania and Vermont adopted programs in a sequential manner. Pennsylvania first initiated agricultural protection zoning, then followed with agricultural districts, right-to-farm legislation and a PDR program. Vermont adopted right-to-farm legislation followed by a PDR program. However, not all States enacted additional measures in a sequential order from least permanent to most permanent. For example, Maryland introduced the use of agricultural districts concurrently with its State PDR program, and some counties simultaneously implemented agricultural zoning. New Jersey enacted the same programs and also passed right-to-farm laws at the same time. Massachusetts implemented its State PDR program and right-to-farm laws within a 2-year period.

Often, these laws are interlinked. For example, agricultural districts, which are voluntary, and agricultural zoning, which is regulatory, usually offer landowners a suite of benefits. These can include additional property tax credits on top of relief provided by differential tax assessment, additional protection from disruption of farming operations through local government use of eminent domain or annexation procedures, and (perhaps most importantly) isolation of farming activities from conflict with interspersed nonagricultural land uses.

Often, to qualify for payments (or other incentives) from particular programs, the landowner must abide by regulations or restrictions on land use or land use changes. For instance, to obtain the protections provided by an agricultural district, landowners must agree to refrain from developing for a specified time. This is for a limited time span, usually 5 to 10 years; it is not permanent. In some cases, landowners must actually agree to retain the land in agricultural use, a condition that is not achievable with the more permanent preservation approach of PDR. With PDRs, the easement does not require landowner to do anything, but instead requires the landowner not to do something—namely, not to develop.

Lesson 6: The design of a State's suite of farmland protection programs depends on the State's specific circumstances.

The case studies revealed that differences in circumstances among States contribute to differences in the implementation and design of farmland protection programs. For example, an insignificant amount of land in Vermont—2 percent—was devoted to urban uses in 1997, and little land that is developed is prime farmland. Yet it has adopted an agricultural PDR program and has preserved more farmland per capita (0.14 acres per capita) than the other four States we reviewed. This may be explained by agriculture's contribution to the State's economy. It is the third most important industry (in terms of receipts) in Vermont, and the agricultural landscape plays a uniquely important role in the State's tourism industry. The agricultural landscape's contribution to tourism in this State may also explain Vermont's unique desire (amongst the five States we reviewed) to first preserve farms with the potential for diversified agricultural uses. Also, it is not surprising to note that an eligibility requirement in Vermont's PDR program is that the land be actively farmed. In contrast, other States

require only that a parcel have sufficiently rich soils to support farming rather than a "use" requirement. Another example is that Maryland is unique among the case study states in that its State agricultural PDR program also seeks to protect woodland parcels, which typically do not have prime soils for cropping. This may be explained by the prevalence of tree farms in certain Maryland counties. These farms provide their own set of amenities and environmental services—values that may not be reflected in land prices.

Lesson 7: Other rural land protection programs substitute for, and complement, farmland protection programs.

Farmland protection programs are conceived, enacted, and implemented within a broad array of policies affecting a variety of rural land uses. Some of these other rural land uses may generate amenities that can substitute for the amenities generated by farmland. For instance, forestland provides aesthetic landscapes, open space, and income contributions to rural economies. Parks also provide aesthetic landscapes and open space.

Alternatively, protected forests and parks are not perfect substitutes for farmland in the generation of amenities. For instance, forestland may not provide the same sense of agrarian cultural heritage as farmland. And, forest landscapes, though scenic, do not provide the same aesthetic qualities as actively farmed fields. Similar arguments can be made concerning parks. On the other hand, parks and forests usually provide public access to outdoor recreation,⁴⁹ an amenity less frequently associated with preserved farmland.⁵⁰

Thus, since they can either substitute or complement the rural amenities provided by farmland, the location and extent of the acreage devoted to nonfarm rural land protection programs may influence the existence and implementation of farmland preservation programs. For example, Massachusetts' nonfarm open space programs (public and private) have protected approximately 16 percent of the land base—the largest percentage among the five case study States. The

⁴⁹ For example, many privately owned forests, such as those of northern Maine, have a tradition of free or inexpensive public access (<http://www.northmainewoods.org/>).

⁵⁰ Farmland can provide outdoor recreational opportunities, such as hunting. However, this is often provided through private leasing, rather than through unrestricted public access (Lewandrowski and Ingram).

funding priorities given to other rural land protection programs may be one reason Massachusetts spends the least per capita on its PDR program (\$1.26 per capita versus \$3.78 - \$4.43 per capita for the other four States studied).

The relative importance of private land trusts in preserving rural land uses can also influence farmland preservation programs. In Pennsylvania and Massachusetts, private land trusts have preserved two and three times the total number of acres that the State agricultural PDR programs have preserved, respectively. In the other States studied here, private land

trusts have also preserved significant amounts of rural land. In general, farmland is but one of several types of rural land preserved by these trusts.

The case studies reveal the importance of considering the existence, funding, and preservation priorities of these other rural land programs, as well as the role of farming in a State's economy, when deciphering public preferences for rural amenities via farmland preservation programs. If ignored, one may incorrectly conclude that farmland preservation programs are insufficiently (or overly) focused on amenities specifically generated by an agricultural landscape.

Conclusions: The Role of Farmland Protection in the Supply of Rural Amenities

In this report, we have examined evidence concerning the goods and services that the public seeks when they legislate and support programs to protect farmland and other rural land from conversion to urban uses. Though the report's focus is on farmland preservation programs, those programs are considered within the broader context of the entire array of programs and public entities that directly affect all rural land uses. In particular, we considered the motivation, structure, and implementation of farmland preservation laws and programs, drawing upon a body of economic theory related to public choice.

Besides food and fiber, agricultural lands provide a variety of non-market outputs. These include rural amenities such as agrarian cultural heritage, open space, scenic beauty of rural landscapes, wildlife habitat, and environmental quality—all of which are unintentional byproducts of the agricultural production process. However, because of the non-market, public good nature of many rural amenities, government programs seek to provide these amenities at levels beyond those that would result from the operation of private land markets. In some cases, the amenities would not be supplied at all without governmental involvement. By examining State and local government efforts to supply these amenities through the structure and implementation of farmland protection programs, we attempt to decipher which rural amenities are considered especially important to the public. Drawing upon this analysis, the report provides several lessons about the public's interest in rural amenities produced by farmland, implications for efficient provision of these amenities, and the potential Federal role in their provision.

First, analysis of legislation enacted by States to enable their farmland protection laws and programs indicates that a large number of rural amenities are sought by States and that the demand for amenities varies by region. The Northeast, Lake, and Pacific Regions seek more amenities than other regions. Within a given region, and across the United States, the most densely populated States are concerned with the full spectrum of rural amenities. Four categories of outputs—open space, agrarian heritage, local food security, scenic beauty—are primary concerns for most

States with farmland preservation programs. Other rural amenities are cited less often in State legislation. Sparsely populated States and regions show less concern about rural amenities; in particular, there is almost no mention of rural amenities in the State legislation of North Dakota, Alabama, Mississippi, Oklahoma, Idaho, New Mexico, and Wyoming. The relatively abundant supply of rural amenities in those States probably accounts for this absence. The more densely populated States, often with less remaining farmland, have enacted a broad portfolio of programs that includes language concerning the protection of many types of rural amenities, apparently perceiving that these amenities are being under-supplied by the unfettered land market.

Second, a review of the agricultural PDR programs allows us to more closely examine the relative weights that citizens place on the multiple rural amenities provided by farmland. In particular, PDR programs often explicitly weigh parcel characteristics in order to prioritize expenditures for easement purchases. These ranking schemes provide us with evidence of the public's preferences for permanently preserved agricultural parcels.

A review of these programs, using data from five Northeastern States, reveals that agricultural PDR programs place high priority on protecting a viable local agricultural industry. The strong emphasis within these PDR programs on agricultural viability is evidence that (at least in the Northeast) active agriculture, and amenities that are uniquely provided by certain types of agriculture, are important to people. Differences in circumstances among States—such as agriculture's contribution to the State economy—can also contribute to variation in the adoption and design of preservation programs.

The emphasis on agricultural viability may also be considered a necessary condition for the provision of rural amenities associated with active agriculture. That is, by selecting the best agricultural lands, the probability that the land will end up being idle, and therefore not provide these rural amenities associated with agriculture, is diminished. This rationale has two consequences. First, it implies that those amenities uniquely associated with active agriculture are de facto favored, versus amenities associated with idle agricultural landscapes. Second, it implies a tradeoff between the long-term provision of amenities (from farms that

are deemed most likely to survive⁵¹) against the optimal set of rural amenities associated with agriculture that could be obtained if farm survival were not an issue. That is, the preservation programs may be designed to favor preserving farms most likely to remain in operation in the long term even though the public may actually prefer an agricultural landscape with different features today.

Overall, the evidence from our analysis of enabling legislation, and the PDR ranking criteria of several States, indicates a emphasis on amenities most associated with active agriculture. In contrast to this finding, our review of survey-derived results reported in the economics literature leads to a different conclusion: the public is concerned with a wider variety of rural amenities, with the continuation of active agriculture often not a predominant concern to taxpayers that support farmland preservation programs. Some people appear to prefer preserving environmental attributes or simply a lack of development to active agriculture.

Does this contrast suggest a discrepancy between the set of rural amenities on which government preservation efforts focus and those preferred by the public? If so, then questions could be raised as to whether the orientation of farmland protection programs should be changed. However, before reaching such a conclusion, it is crucial to recognize that farmland protection programs occur within the context of a broad array of other rural land protection programs.⁵² Placed within such a context, this apparent discrepancy may be resolved. That is, as described in Appendix 5, given the existence of other rural land protection programs, it may be appropriate that farmland protection programs target those rural amenities associated with active agriculture.

For example, consider the relationship between agricultural PDR programs and national/State parks. Parks and farmland may be considered substitutes in the sense that both provide a “lack of development.” However, parks and farmland may be considered complementary in that each provides amenities that the

other does not. While parks provide public access to the amenity of outdoor recreation, there are amenities (e.g., cultural heritage, rural or agrarian landscape) that only farmland can provide. PDR programs may have the liberty of targeting farms for preservation that are agriculturally viable with less emphasis on preserving other rural amenities, when amenities not provided by farmland (e.g., outdoor recreation) are provided by other programs. Thus, the emphasis of agricultural PDR programs on agricultural viability may not be a weakness of program design, but merely a reflection of the reality that agricultural PDR programs are implemented in the context of broader land use schemes and mixes of programs to protect an array of rural amenities.⁵³

Third, PDR programs give program administrators some ability to target the type and location of lands that are preserved, and thus, the array of rural amenities that are a priority. Although PDR programs are voluntary and the outcome depends on landowners’ decisions to participate, the programs are almost always oversubscribed, which allows the program agency’s preferences to influence which parcels and amenities are preserved. State and local governments use ranking systems to prioritize easement sale applications. Program administrators can prioritize parcels with desirable characteristics or those that are critically located. For example, examination of several programs’ ranking systems reveals that parcels with high soil quality are given higher priority, as are parcels adjacent to previously preserved farms.

The choice of preservation program design is also important. For example, the use of TDR programs preserves large blocks of contiguous farms, perhaps increasing the viability of the local agricultural industry and thus each individual farm.⁵⁴ However, TDR is not effective at targeting specific characteris-

⁵¹ We abstract from issues of how well these factors such as soil quality predict farm survival. In fact, anecdotal evidence suggests that other factors, such as the ability to respond to the demands of urban consumers, are often equally important.

⁵² This report’s case studies highlight the variety of rural land conservation programs that States implement. These programs protect a mix of rural land uses— including parks, forestlands, and open space, as well as farmland.

⁵³ It is interesting to note that most of the reviewed surveys do not simultaneously consider other forms of rural land protection when investigating the reasons for supporting farmland preservation. Such a multivariate model would better measure the importance of farmland’s ability to provide rural amenities associated with active agriculture, relative to rural amenities that are not associated with active agriculture.

⁵⁴ Although land in “sending areas” is not truly preserved (in the sense of conservation easements existing on each parcel), and the zoning can change, it is much less likely that zoning will change. This is because zoning decisions in these areas must be taken with regard to the entire area and not with regard to individual parcel. It is the relative ease of obtaining variances (on individual parcels) that reduces the effectiveness of traditional zoning (AFT 1997).

tics; TDR cannot target the highest quality soils and by definition preserves all the land types in the “sending” area. Another example is parks, which are more suitable for providing amenities for which public access is crucial (such as outdoor recreation).

Fourth, preserving amenities by preserving farmland is not synonymous with eliminating all development. For example, almost all agricultural PDR programs allow “family” lots; in reality, the density of development is reduced, but not eliminated. This leaves open the question of whether the beauty of the rural landscapes and the agrarian cultural heritage are actually preserved.

Finally, given that agricultural PDR programs focus on farmland protection, limited funding implies tradeoffs in preserving particular characteristics—for example, protecting the most threatened land in the urban fringe or greater acreage farther away from the currently urbanized areas. Preserving farmland at the urban fringe provides the associated amenities in close proximity to many people (though on scattered smaller acres, with perhaps less long-term viability), whereas protecting far-away rural land gives protection to more acres for the same amount of money, and may preserve more “cultural heritage.” There seems to be a preference to have the preserved farmland in close proximity to urban populations, where the rural amenities are being lost most rapidly as farmland is converted to nonagricultural uses.

Given the limitations of the kind of data examined in this report (that is, data on the adoption, language, and implementation of public programs), our ability to address issues of where program dollars are best spent is limited. Furthermore, evidence that efficiency gains may be possible by changing a State’s program priorities to achieve different outcomes should be interpreted with caution when applied to other, systematically different, States. Yet given these provisos, we can discuss some implications for the Federal Government’s role in farmland preservation.

Implications for a Federal Role

In considering its role,⁵⁵ the Federal Government might first consider whether spillovers from develop-

⁵⁵ Heimlich and Anderson discuss pros and cons of a potential Federal role in land use policy toward developing urban fringes. Among other conclusions, they remark on the potential for Federal assistance to help improve State and local planning capacity.

ment of a region (and thus conversion of farmland) are national in extent or whether the spillovers are largely local. The analyses conducted in this study indicate that there is a large array of “rural amenities” desired by American consumers. Local governments, in conjunction with local landowners, by legal mandate and tradition, largely control the supply of these amenities. Implementation of public programs intended to prevent development and preserve farmland is one means by which this control occurs. This suggests that many of the amenities sought by implementation of public programs to preserve farmland are local in nature, meaning that the benefits will accrue to the urban populations associated with urbanizing fringes of cities and to the residents of those urbanizing fringes. Yet to the extent that the appreciation of local rural amenities is not limited to residents of a single State (or county), and to the extent that the American population moves across State lines, the Federal Government does have a role in representing the Nation’s interests in rural amenities.

Second, the Federal Government, in considering its role in rural amenity preservation, is presented with choices regarding which specific amenities it desires to preserve. For example, given limited budgets of farmland protection programs, there will be tradeoffs between preserving the largest number of acres and preserving those acres in close proximity to urban centers, or preserving the largest number of acres and preserving the most productive acres. Since different kinds of amenities are provided by protecting as many acres as possible, by protecting the most threatened acres, or by protecting the most productive acres, it is important to consider the relative values, today and in the long term, of these amenities when deciding what to preserve.

With the passage of the 2002 Farm Security and Rural Investment Act (the Farm Bill), contains an order of magnitude increase in Federal support for the Farmland Protection Program (FPP), this concern is timely (see box on p.13). As noted above, the existence of a broad array of rural land protection programs suggests that it is appropriate for farmland protection programs to focus on rural amenities associated with active agriculture, even though there is mixed evidence on the overall importance of these active agriculture rural amenities. However, a large increase in farmland protection funds, relative to other funds for protecting other rural lands, could upset this balance. Given the significant increase in Federal

funding for farmland protection, the balance between existing agriculture-focused priorities and other rural-amenity objectives may deserve further consideration.

Third, in determining a national role in farmland preservation, consideration needs to be given to whether the preservation is to be permanent or temporary, and whether public access for outdoor recreation is of primary importance.⁵⁶ Farmland preservation policies coexist with other rural land conservation policies, as well as with a preexisting mass of protected public lands. Since these lands also provide rural amenities, the Federal Government could help provide a broader perspective on what types of lands are best preserved. In addition, the allocation of Federal funds to different programs (farmland acquisition or acquisition of parkland) influences the mix of preserved rural amenities. Hence, coordination of this funding may be beneficial.

⁵⁶ Since farmland protection programs in the United States rarely (if ever) allow for public access, a need for public access would suggest that other methods (such as outright purchase of open space) would be a better use of government funds. However, there are instances (such as in Massachusetts) where forestland conservation easements are combined with public access. Also, public access to farmlands in Europe is not uncommon. Hence, it is conceivable (though potentially controversial) to include public access as an additional component of an agricultural conservation easement.

Fourth, once the amenities most in need of preservation have been identified, some means of targeting their protection is called for. This targeting can take place in a number of ways, including the choice of tools in the farmland preservation portfolio, the weights used in PDR ranking schemes, and by the degree of cooperation among local, State, and national governments and land trusts (or other nongovernmental organizations).⁵⁷

In closing, the set of rural amenities available to rural and urban residents alike is determined by a large and complex network of policymakers, from various levels of government and nongovernmental organizations, using a wide array of amenity preservation tools. These entities, in aggregate, paint the urbanizing landscape.

⁵⁷ The combination of approaches and tools used for farmland preservation largely determines which array of amenities get preserved. For example, more acres per dollar, more water quality, increased populations of some wildlife species, and a greater variety of agricultural systems are often associated with preserving lower quality land (e.g., grazing land or woodland); while fewer acres, lower water quality, lower populations of wildlife, and more negative spillovers on nearby nonagricultural residents are often associated with preserving high-quality cropland.

Appendix 1—Rural Amenities: A Problem in the Private Provision of a Public Good

In economic terms, the provision of rural amenities is largely a problem in the “private provision of public goods.” Simply put, rural landowners are not likely to receive compensation for production of rural amenities, hence they may not be motivated to produce them. Moreover, should a consumer go to the trouble of compensating a rural landowner to produce more of a rural amenity, she may not take into account that the unit of the rural amenity she pays the farmer to create will also benefit other consumers. Both of these factors lead to underproduction of the rural amenity.¹

Following Falkinger, this problem can be formally stated (in economic terms) as follows.

Presume that an individual i with income y_i maximizes utility

- i) $U(c_i, G)$
- ii) subject to $c_i + p_G g_i = y_i$
- iii) $G = \sum_{i=1..N} g_i = g_i + G_{-i}$

The notion is that each individual produces (or purchases) g_i units of the public good, which then become part of G , the total quantity of the public good. Note that c is a private good with implicit price of 1; the price of $G = p_G$, and G_{-i} is the contribution of all other individuals.

The standard assumption on individual behavior in this setting is based on the idea of a Nash equilibrium; where each individual assumes that G_{-i} is fixed. Thus, the solution of i , subject to ii and iii, yields:

$$\text{iv) } MRS_i = (du/dG) / (du/dc_i) = p_G.$$

That is, the individual equates her own value of an extra unit of the public good against the forgone consumption of the private good (where the cost of producing the public good is measured in terms of less consumption of the private good).

However, since an increase in G will increase the utility of all individuals simultaneously, the Pareto

¹ For example, a landowner has little incentive to preserve the rural amenities generated by a scenic farm because all passerbys can enjoy its charms for free. Similarly, a passerby who decides to pay a farmer to improve the scenic beauty of the farm is not likely to fully consider that this improvement also benefits other passerbys.

optimum occurs when the “Samuelson condition” (Samuelson) is met:

$$\text{v) } p_G = \sum_{n=1..N} MRS_n$$

Clearly, iv is less than v, which implies that individuals will choose too low a value of g_i , and the public good will be underprovided.²

The net effect is that not enough rural amenities are produced—even though all members of society (rural landowners and consumers) could potentially be better off with more of this public good. There may be much to gain by correcting this market failure through the use of private initiatives and government programs.

Ideally, this market failure could be corrected if society could invent and implement mechanisms to induce people to reveal their personal preferences for public goods, and subsequently collect this willingness to pay from each consumer. Such a mechanism could ensure that public goods are provided efficiently (and without governmental intervention) by voluntary private action.

Perhaps the closest mechanism to this ideal is that of charity—individual contributors supporting an endeavor that they believe in. However, although charity may be efficacious (and lead to provision beyond that of the pure market), as evidenced by laboratory work (Ledyard) problems of free (and “easy”) riding are likely to limit the potential of purely voluntary provision of pure public goods, including rural amenities.

Collective private initiatives refer to the variety of voluntary organizations dedicated to preserving some aspect of the rural landscape, as typified by private land trusts. Here, a self-selected group agrees to provide rural amenities. In some cases these amenities may be highly localized, so that the good purchased has an “inclusive club good” nature - the flow of benefits can be retained by a limited group, with non-members of this group excluded. Under some circumstances, this will encourage efficient provision of rural amenities. However, to the extent that the rural amenity (e.g., a protected farm) yields benefits to the entire population, the problem of underprovision will remain.

² For a more complete discussion, see Cornes and Sandler.

Instead of depending on private actions, collective public action through governmental processes is often used to provide public goods. Unfortunately, optimal provision of public goods through governmental intervention is complicated by practical and theoretical difficulties in determining a program's size and scope, its administration, and how it will be funded.

For example, one simple mechanism is to use a public referendum combined with simple tax schemes. If individuals hold convex³ but heterogeneous⁴ preferences between the public good and a private good, and the decision rule is majority voting in a population of such individuals, then the level of provision will be that of the median voter (since larger, or smaller, provisions are opposed by a majority of voters; Bergstrom and Goodman). However, unless the median is the same as the mean, the "Samuelson condition" (equation v above) will not be met.

In recognition of the problems associated with simple majority rules, recent years have seen a flowering of economic literature on methods for inducing efficient provision of public goods from private producers (Cornes and Sandler offer a good review). The basic goal is to induce consumers to truthfully reveal their (possibly heterogeneous) preferences for the public good (e.g., maintenance of healthy rural communities), to obtain commitments of funding from these individuals commensurate with the strength of their preferences, and to ensure that these committed funds are sufficient to fund the production of the good.

Most of this literature (for example, Groves and Ledyard, or see Laffont and Maskin for a review) investigates voluntary contribution mechanisms, supplemented by redistribution/refund mechanisms. In general, these mechanisms must balance simplicity of design, information requirements, robustness as preferences vary, and incentive comparability (for example, whether truth telling is dominant, or whether it's a Nash equilibrium). Although recent work is promising (Falkinger et al., Rondeau et al.), in general, one rarely finds formal voluntary schemes outside of the experimental economics laboratory.

³ Convex refers to an increasing rate of substitution between two goods. Thus, to hold an individual's overall utility constant when taking away successive units of the first good (the public good) will require ever-increasing increments in the quantity of the second good (the private good).

⁴ Heterogeneous refers to preferences that vary across the population.

In some cases, given information about the shape of preferences and individual incomes, and given a non-uniform tax policy, it is possible to construct a majority decision rule that does lead to a Pareto efficient outcome (Black, Cornes and Sandler, pp. 210). However, given a bundle of several public goods (which is the case for rural amenities supplied by agricultural land), majority voting will typically not yield a unique equilibrium.

In addition to the theoretical problems of designing programs, there are also questions of administration. Economics suggest two (possibly competing) factors influencing an administrator of government programs: service maximization and size of the bureau's budget.⁵ Service maximization means increasing the flow of services valued by the public, whereas budget maximization (or maximization of discretionary budget) relates to an increase in the salary and other perquisites of office (Niskanen; Migue and Belanger).

To the extent that service maximization is important, bureaucratic decisions will reflect the underlying preferences of the public. Although the empirical literature is thin,⁶ recent work on environmental issues show that public preferences do shape program design. For example:

- Bureaucracies are sensitive to questions of cost and benefit, and to public input (Cropper et al., Yates and Stroup).
- Bureaucracies are responsive to the desires of their constituencies, whether charitable donors (Hewitt and Brown) or legislative bodies (Weingast and Moran).

In summary, despite difficulties in achieving optimal results, the use of government programs, initiated through representative forms of government and administered by bureaucracies, can address the problem of providing public goods (such as rural amenities).

⁵ The analysis of government decisions is closely related to of the economics of public choice, which postulates that voters support programs that maximize their utility (Stevens). When choosing public goods, individuals partially act as if they were making choices affecting their own consumption of goods and services (Reichelderfer and Kramer), and partially as citizens expressing their values (Margolis; Quiggin). In either case, preferences are being acted upon.

⁶ Starting with McFadden's analysis of highway routing, the economics literature devoted to the analysis of government programs has tended to abstract from issues of motivation, and has focused on how institutional factors influence bureaucratic choice.

Appendix 2—Econometric Analysis of the Adoption of PDR Programs

To conduct the econometric analysis of the factors influencing the adoption of agricultural PDR programs, county-level PDR data from seven of the most active States identified by Bowers (1997) are utilized. The data contain information regarding total preserved acres in each county since the inception of the PDR program. A description of this data summarized by State appears in appendix table 2.1. Although each of the seven States listed in appendix table 2.1 has a statewide PDR program,¹ not every county in each State participates.

The econometric model is estimated under the assumption that the existence of PDR programs is influenced by a number of factors, including income, population density, changes in population density, agricultural land density, and changes in agricultural land density. These variables are used to examine several hypotheses about what stimulates the adoption of farmland protection programs:

1. Amount of farmland and rate of conversion of farmland:

Since agricultural PDR programs focus on farmland, the available amount and the rate of conversion into urban uses are likely to be important factors that explain the distribution of these programs. It is expected that programs will occur in areas with ample amounts of farmland, but also with high conversion rates of farmland into urban uses.

¹In some States, the programs are funded at the county level with the State merely providing enabling legislation. In other States there are State-funded programs in which counties can choose to participate.

2. Population pressure:

As areas become more urbanized, residents are more likely to place a larger value on open space that is provided by farmland.

3. Rate of change of population:

Rapid rather than gradual expansion in population may spur the creation of PDR programs. Residents may notice a rapid change in development of farmland and demand institutions such as PDRs to preserve open space.

4. Income:

Income also plays a role both in the demand for farmland preservation and the amount of land preserved. Environmental goods such as open space are likely to be luxury goods. Residents in counties with high income levels would be more likely to demand PDR programs. Income levels are also an indication of the tax base, which would influence the amount of land preserved if the PDR program involves cost sharing at the county level.

Appendix table 2.2 shows the qualitative impacts of these variables both on the existence of a program and on the magnitude of land preserved. As anticipated, most of the variables have positive impacts on adoption of PDR programs. Although three of the five factors have negative influences in explaining the existence of PDR programs, they are not statistically different from zero in the model. In terms of explaining the amount of land preserved, all of the factors have the anticipated positive impact (although the coefficient for population pressure is not statistically different from zero).

Appendix table 2.1—County Level PDR Activity

State	Total counties in each State	Counties with PDR programs	Total acres preserved	Total acres preserved per sq. mile of area ¹
Pennsylvania	67	37	106,481	4.31
Maryland	23	21	215,142	26.21
New Jersey	18	14	48,621	8.60
Massachusetts	14	11	39,350	4.92
Connecticut	8	8	25,483	5.30
Delaware	3	3	15,749	8.58
Vermont	14	14	65,935	7.68
Total	147	108	516,761	9.82

¹Total acres preserved divided by total area (in square miles) of the counties practicing PDR programs.

Source: Bowers, 1997.

Appendix table 2.2—Qualitative impact of factors affecting PDR programs

Factor ¹	Direction of impact on:	
	Existence of program	Amount of land preserved
Mean income	Positive	Positive
Population pressure	Negative ²	Positive ²
Change in population pressure	Negative ²	Positive
Ag land density	Positive	Positive
Change in ag land density	Negative ²	Positive

¹ Income is the county mean income in \$1,000 units, “Change in population pressure” is the change in the urban influence measure from 1970 to 1990. “Population pressure” is the 1990 urban influence variable. “Ag land density” is the density of farmland per square mile. “Change in ag land density” is the ag land area in 1987 minus the ag land areas in 1997, per square mile of county or State area. The urban influence variable, used by Barnard, Whitaker, et al. (1997) takes into account both the density and proximity of population in a specific area using a gravity measure similar to one used by Shi et al., 1997. The variable itself is derived from the 1990 Census of Population data using a function in the ARC/INFO GIS software package.

² This indicates that the parameter was not statistically different from zero in the model (at a 95-percent confidence level). Note that the R-square for the “amount of land preserved” equation is 0.52.

The parameters of the model can be used to compute elasticities² of land preserved with respect to each factor. This gives an indication of how changes in these factors impact the amount of land preserved.³ Elasticity estimates appear in appendix table 2.3. The elasticity of land preserved with respect to income is quite large. Since the income variable measures annual per capita income, a small (one percent) change in income would represent a large change in aggregate county wealth, especially in comparison to the amount spent on PDR programs. Both the population pressure elasticities and the change in population pressure (measured in 1,000 person units) are also large. This indicates that the amount of land preserved by these programs is quite sensitive to income and population pressure. Changes in agricultural land density have a large impact compared to agricultural land density itself. Each of these variables are in the same units and their elasticities are approximately the same order of magnitude. However, changes in agricultural land per county (defined as the loss of farmland from 1987 to 1997) is a much smaller number than acres

of farmland in a county.⁴ This may indicate that land preservation is more sensitive to losses of farmland than to the total amount available.

⁴ On average, agricultural land density is 0.151 (thousand) acres per square mile of county area. Changes in agricultural land density average 0.016 (thousand) acres per square mile of county area.

Appendix table 2.3—Censored regression of participation intensity elasticities

Variables ¹	Elasticities ²
Mean income	4.964
Ag land density	0.322
Change in ag land density	0.260
Population pressure	2.485
Change in population pressure	0.614

¹ Mean Income is the mean county income in \$1,000 units. Change Ag Land Density is the area of farmland (1,000 acres) per square mile observed in 1987 minus the area (1,000 acres) of farmland per square mile observed in 1997. Ag Land Density is the area (1,000 acres) per square mile of farmland observed in 1997. Population Pressure is the 1990 urban influence measure divided by 1,000. Change in Population Pressure is the 1990 urban influence variable minus the 1970 urban influence variable divided by 1,000.

² Censored regression model elasticities where the dependent variables are total area preserved (1,000 acre units) per square mile.

² These elasticities can be interpreted as the percentage change in land preserved per a 1-percent change in a factor.

³ See Feather and Barnard for further details.

Appendix 3—Classifying Farmland Protection Laws, Using The Expanded List of Rural Amenities

In table 2b (p. 22) we identify five categories (and four sub-categories) of rural amenities. We also identify a larger list of 17 categories (appendix table 3.1). This expanded list was then used as a basis for classifying State farmland protection laws (appendix table 3.2).

The bottom row of appendix table 3.2 lists the number of States that mentioned the category of output listed at the top of each column. Three categories are mentioned by over half of the States as amenities desirable for protection: “local food security/quantity” (27), “scenic beauty (and other aesthetics), including viewing wildlife or farm activities” (27), and “unique terrain/agrarian cultural heritage/historic/nostalgia” (26). In contrast, only three States mentioned “national food security.”

A quick look at the body of appendix table 3.2 reveals one obvious and easily identifiable aspect of the data: the X’s are relatively dense in the Northeast and Pacific, relative to the rest of the Nation, and especially relative to the Northern and Southern Plains, Southeast, and Mountain States. In fact, the only “output” not mentioned in the enabling legislation of at least one Northeast State is “national food security/quantity.” Surprisingly, only Maryland and Vermont mention the “lack of congestion/development—low density—physical space” category. This is despite the relatively high degree of development in all Northeastern States.

In contrast to the Northeast, there are 12 of 18 output categories that are not mentioned by any Northern Plains State. Further, with the exception of Nebraska, an

additional five categories are not mentioned. Seven categories are not mentioned by any of the eight Mountain States. And, with the exception of Montana, an additional four categories are not mentioned. Those output categories not mentioned in both the Northern Plains and the Mountain States are mainly those related to productive agriculture, including “national food security/quantity,” “agricultural viability/active agriculture/preserve farming,” “preserve agriculture’s contribution to local economy/agricultural jobs,” “live rural way of life/sense of community/‘sense of place’.” “Air quality” and “forest use” are also not mentioned. A nearly identical result occurs for the Southeast.

Upon closer examination, there are two other notable observations. First, seven States make no mention of rural amenities at all, including North Dakota, Alabama, Mississippi, Oklahoma, Idaho, New Mexico, and Wyoming. In addition, Kansas, South Dakota, South Carolina, and Texas mention only “local food security/quantity.” Nevada mentions only the category labeled “scenic beauty (and other aesthetics), including viewing wildlife or farm activities.” In contrast, the Pacific States are similar to the Northeast.

Three categories of outputs have the most universal appeal geographically: “food security,” “scenic beauty, including viewing wildlife or farm activities,” and “agrarian cultural heritage/historic/nostalgia/unique terrain.” Open space concepts (with and without public access) and wildlife habitats also have wide appeal, being mentioned by nearly half the States.

Appendix table 3.1—Rural amenities and other outputs from farmland

Expanded List		Condensed List	
1	Lack of congestion/development low density—physical space	1	Orderly development Low density; physical space;
2	Orderly development		Orderly development of rural land; lower public utility provision costs; prevention of sprawl
3	Lower public utility provision costs		
4	Local food security/quantity	2	Local and national food security (quantity/quality)
5	National food security		
6	Preserve agricultural contribution to local economy/agricultural and timber jobs	3	Preserve local agricultural/timber economy/agricultural/timber jobs/other natural resource economy and jobs
7	Forest use		
8	Water quality/quantity/control/recharge	4	Protection of environmental services amenities: pollution reduction; groundwater recharge; flood control; water quality/quantity; air quality
9	Air quality		
10	Other environmental services		
		5	Protection of rural amenities
11	Open space —outdoor recreation— including scenic parks/landmarks, visual settings; including lack of, or prevention of, or slowing of development	5.1	Open space , usually visual; including lack of, or prevention of, or slowing of development
12	Agrarian cultural heritage /historic/ nostalgia/unique terrain	5.2	Rural/agrarian character: Agrarian cultural heritage/historic/nostalgia/unique terrain; Preserve farming/active agriculture/agricultural viability; Live rural way of life/sense of community/ "sense of place"
13	Preserve farming /active agriculture/ agricultural viability		
14	Live rural way of life /sense of community/ "sense of place"		
15	Wildlife habitats	5.3	Wildlife habitats / Natural areas
16	Natural areas		
17	Scenic beauty (and other aesthetics), including viewing wildlife or farm activities	5.4	Aesthetics , usually visual, including scenic beauty, viewing wildlife or farm activities

Appendix table 3.2—Amenities mentioned in legislation (using expanded list)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
		CGST	ORDR	UTLT	LFOOD	NFOOD	AGJOB	FORST	WATER	AIR	ENVIR	OS	AGRAR	VIABL	WAY OF	WILDLIFE	NATUR	SCNIC		
Original list		1 (DEV)			2 (FSEC)			3 (ECON)		4 (ENV)										
Northeast	CT				X			X	X			X	X			X		X		
	DE				X		X		X		X	X	X	X	X	X	X	X		
	ME		X	X	X			X	X	X	X	X	X	X	X	X	X	X		
	MD	X	X	X	X			X			X	X	X	X	X	X	X	X		
	MA				X				X	X	X	X	X	X		X		X		
	NH								X			X	X		X	X		X		
	NJ		X	X	X		X		X		X	X	X	X	X		X	X		
	NY				X		X			X	X	X	X					X		
	PA		X	X	X		X	X	X	X	X	X	X	X	X				X	
	RI		X	X	X		X		X		X	X	X	X	X		X	X	X	
VT	X	X		X		X	X	X			X	X	X	X		X	X	X		
Lake States	MI	X			X	X	X					X								
	MN		X		X		X	X			X	X		X	X			X		
	WI		X					X	X	X		X						X		
Corn Belt	IL	X			X		X	X		X	X	X	X			X	X	X		
	IN				X															
	IA	X	X		X		X					X	X	X		X		X		
	MO		X				X		X			X	X					X		
	OH							X	X			X		X		X	X	X		
North Plains	KS				X															
	NE	X		X					X			X	X							
	ND	NONE																		
	SD				X															
Appalachian	KY				X		X	X	X	X	X	X	X	X		X	X	X		
	NC				X			X			X			X	X					
	TN	X	X				X	X	X			X	X			X		X		
	VA				X			X		X	X					X	X	X		
	WV				X									X	X			X		
Southeast	AL	NONE																		
	FL												X			X		X		
	GA				X			X		X		X				X				
	SC				X															
Delta	AR				X						X	X	X	X		X	X			
	LA						X	X	X	X	X	X	X	X				X		
	MS	NONE																		
South Plains	OK	NONE																		
	TX				X															

Continued—

Appendix table 3.2—Amenities mentioned in legislation (using expanded list)—Continued

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
		CGST	ORDR	UTLT	LFOOD	NFOOD	AGJOB	FORST	WATER	AIR	ENVIR	OS	AGRAR	VIABL	WAY OF	WILDLIFE	NATUR	SCNIC	
Original list		1 (DEV)			2 (FSEC)			3 (ECON)		4 (ENV)									
Mountain	AZ				X							X	X			X		X	
	CO				X						X	X	X			X		X	
	ID	NONE																	
	MT	X	X	X							X	X	X			X	X	X	
	NV																	X	
	NM	NONE																	
	UT											X	X			X		X	
	WY	NONE																	
Pacific	CA		X	X	X	X	X	X	X			X	X	X	X	X	X	X	
	OR		X	X	X	X	X	X			X	X	X					X	
	WA	X			X		X	X	X	X	X	X	X	X		X		X	
48 States	9	14	9	30	3	16	17	19	10	20	31	27	17	9	23	13	30		

Column Key:

- 1 (CGST) Lack of congestion / development --- low density --- physical space.
- 2 (ORDR) orderly development.
- 3 (UTLT) lower public utility provision costs.
- 4 (LFOOD) local food security / quantity.
- 5 (NFOOD) national food security.
- 6 (AGJOB) preserve ag contribution to local economy / ag jobs.
- 7 (FORST) forest use.
- 8 (WATER) water quality / quantity / control / recharge.
- 9 (AIR) air quality.
- 10 (ENVIR) other environmental services.
- 11 (OS) open space.
- 12 (AGRAR) agrarian cultural heritage / historic / nostalgia / unique terrain.
- 13 (VIABL) agricultural viability / active agriculture / preserve farming.
- 14 (WAYOF) live rural way of life / sense of community / "sense of place."
- 15 (WILDLIFE) wildlife habitats.
- 16 (NATUR) natural areas.
- 17 (SCNIC) scenic beauty (and other aesthetics), including viewing wildlife or farm activities.

Appendix 4—Review of Ranking Criteria

This appendix contains several tables that describe the ranking schemes of several agricultural PDR programs in the five States whose array of open space and preservation policies were analyzed in the preceding section of this report.¹

- Appendix table 4.1 contains a detailed breakdown of weights used in several ranking schemes. The

¹ We would like to acknowledge the assistance of American Farmland Trust’s Technical Information Center and Donna Menino of AFT’s Maryland Office in providing a large number of the ranking criteria forms and documentation.

columns indicate whether the PDR program is a State or county program, the rows list factors used when ranking parcels. When points are assigned, the scale is typically unique to each program; to ease interpretation, rather than report specific points the table reports the maximum percentage of total points assigned to each category.

- Appendix table 4.2 lists some minimum eligibility requirements for several State and county agricultural PDR programs.
- For illustrative purpose, the box below shows a portion of a typical ranking scheme.

Example of a Ranking System

Subset of the Harford County, MD, Easement Priority Ranking System (total 300 points)

1. Soil Productivity Score (LESA program) (only used for cropland)	= (100 pts. max)	_____
2. Farmland Capability	(35 pts. max)	
A. Cropland		
i. 75%-100% cropland	= 30 pts.	_____
ii. 50-74% cropland	= 20 pts.	_____
iii. less than 50% cropland	= 10 pts.	_____
B. Pasture		
i. 75%-100% pasture	= 15 pts.	_____
ii. 50-74% pasture	= 10 pts.	_____
iii. less than 50% pasture	= 5 pts.	_____
C. Innovative farming practices	= 0–30 pts.	_____
3. Development Factors	(75 pts. max)	

Appendix table 4.1—Summary of ranking criteria weights as a percent of total points, selected PDR programs

		Maryland						Massachusetts
		State Rural	State PDR Program			County PDR	County PDR	State PDR
		Legacy (Cecil)	Caroline	Carroll	Harford	Howard	Montgomery	All counties
Land in farms, 1997 ^a	<i>acres</i>	2,150,000	111,000	160,000	94,000	40,000	77,000	500,000
Percent land area in farms	<i>percent</i>	35	54	56	33	25	24	10
Base points						18	15	
Soil capability								
Soil productivity		15	44	75		9	44	(1)
Land evaluation and site assessment score					33	5		
Parcel size		5	22	3	5	27	5	(3)
Farmland Management								
Use of land for crops & pasture/ percent tillable					12			
Farm capital improvements								
Owner operated					7			
Farm product sales							4	
Soil conservation plan/stewardship					7		1	
Importance to agricultural community		20			5	9		✓
Duration of family farming								
Unsubdivided farm								
Potential for diversified agricultural use								
Location								(1)
Contiguous to easement/restricted land			11		7			
Near easement/restricted land		25		7				✓
Contiguous to land with easement sale application								
Contiguous to other protected open space								
Percent adjoining land in ag security area/ districts			22					
Percent nearby land in ag security area/ farming area								
In/near exclusive ag zoning or right-to-farm area								
Consistency with county land use plan/zoning		10			7	14		
Development Pressure								(2)
Threat of conversion/significant nonag use nearby ***					3		15	
Near water & sewer service areas					3			
Availability of public water & sewer**								
Number of dev rights given up				4	7	7		
Road access/frontage				4		9	15	
Minimal septic limitations				7				
Near water bodies, good schools								
Historical/scenic/environmental significance								✓
Tenant dwellings						2		
Other								
Local government support								✓
Special conditions (economic hardship, young farmer, etc)					5			
Presence of natural resources/environmentally sensitive land		25						✓
Relative best buy			✓	✓	✓			✓
Other								
Total points		100%	100%	100%	100%	100%	100%	(n/a)
			Note (A)	Note (B)	Note (C)	Note (D)	Note (B)	

See footnotes at end of table.

Continued—

Appendix table 4.1—Summary of ranking criteria weights as a percent of total points, selected PDR programs—Continued

		Pennsylvania* State PDR Program				New Jersey	Vermont
		Lancaster	Luzerne	Union	Montgomery	State PDR All counties	State PDR All counties
Land in farms, 1997 ^a	<i>acres</i>	392,000	57,000	63,000	42,000	800,000	1,300,000
Percent land area in farms	<i>percent</i>	65	10	31	14	18	21
Base points							
Soil capability							
Soil productivity		40	54	40	40	14	(1)
Land evaluation and site assessment score							
Parcel size		10	4	6	3	9	(2)
Farmland Management							
Use of land for crops & pasture/percent tillable		2	4	6	1	14	
Farm capital improvements					3		(3)
Owner operated							
Farm product sales		5		5	5		
Soil conservation plan/stewardship		2	5	5	10		(4)
Importance to agricultural community							(2)
Duration of family farming					1		
Unsubdivided farm				5			
Potential for diversified agricultural use							(1)
Location							
Contiguous to easement/restricted land		13		5	6	18	(2)
Near easement/restricted land			5			9	(2)
Contiguous to land with easement sale application		5	5				
Contiguous to other protected open space				2			(2)
Percent adjoining land in ag security area/districts		1	5	3	5		
Percent nearby land in ag security area/farming area				3			(2)
In/near exclusive ag zoning or right-to-farm area				3		5	
Consistency with county land use plan/zoning		1	5	4	14	6	
Development Pressure							
Threat of conversion/significant nonag use nearby ***		12	3	3	1	9	(2)
Near water & sewer service areas			3	3			(2)
Availability of public water & sewer**		4	3	3	1	3	
Number of dev rights given up							
Road access/frontage		4	3	3	3		(2)
Minimal septic limitations							(2)
Near water bodies, good schools							(2)
Historical/scenic/environmental significance		1	3	3	3		(2)
Tenant dwellings							
Other							
Local government support						5	(2)
Special conditions (economic hardship, young farmer, etc)							
Presence of natural resources/environmentally sensitive land				2	5		
Relative best buy						✓	
Other						9	
Total points		100%	100%	100%	100%	100%	(n/a)

Note (E)

^a Source: 1997 Census of Agriculture at <http://www.nass.usda.gov/census/census97/county/farms/index.htm>

* Pennsylvania has 7.2 million acres in farms (25 percent) in 1997.

**Pennsylvania counties award max points if public water & sewer service exists; New Jersey awards points if service is absent.

***All programs except Cecil County, MD award max points if threat of conversion is high; Cecil awards max points if threat is low.

Notes

(1) - (4) Massachusetts and Vermont do not use formal point systems. Numbers (1) - (4) indicate the categories that are considered, in order of importance. A check mark (✓) indicates the category is considered also in the rankings. (A) If 20 points are not earned based on soil quality, Caroline County awards up to 12 or 8 points to farms specializing in specialized food production or non-food agricultural production, respectively. (B) Assumes 200 acre farm. For Carroll County, assumes five lot rights given up and within ½ mile of 500 acres in easements. For Montgomery County, assumes property is within ½ mile of ag zoning edge (C) Harford County awards 30 points for innovative farming practices if use of land totals less than 35 points. (D) Howard County deducts points if tenant dwellings exceed one per 50 acres, and awards points if landowner agrees to one dwelling per 50 acres for future tenant dwellings. Also assumes eight development rights are given up. (E) New Jersey deducts up to 10 points if lot rights are retained.

Appendix table 4.2—PDR program minimum eligibility criteria

Requirement	Maryland			Pennsylvania	New Jersey	Massachusetts	Vermont
	State PDR All counties	County PDR Howard	County PDR Montgomery	State PDR Select counties	State PDR All counties	State PDR All counties	State PDR All counties
In agricultural district/ag security area	Yes	In zoning district requiring clustering	Yes	Yes	Yes		
Parcel size	100 contiguous acres, less if contiguous to existing easement	100 acres, or 25 acres if adjacent to at least 50 easement acres	None	50 acres, or 10 acres if contiguous to easement		5 acres	Must be viable farm unit or contribute to adjacent farm
Soils	50% in USDA soil capability Class I-III and / or woodland group I or II	50% in USDA soil capability Class I-III and 66% in Class I-IV	50% in USDA soil capability Class I-III	50% in USDA soil capability Class I-IV			
Use of land				50% or 10 acres in harvested cropland, pasture or grazing land		Agricultural or horticultural use	Must be actively farmed
Conservation plans	Water quality and soil conservation plans required	Water quality and soil conservation plans required	Water quality and soil conservation plans required	Water quality and soil conservation plans required	Water quality and soil conservation plans required	Parcel ranked higher if conservation plans are in place	Parcel ranked higher if conservation plans are in place
Landowner bid/payment caps	(landowner bid affects ranking)			Max \$2,500/acre in Luzerne County; max \$10,000/acre in Montgomery	(landowner bid affects ranking)	Max \$10,000/acre	Lesser of \$975/acre or easement value
Farm gross income test			(affects ranking)	(affects ranking in some counties)		\$500 plus \$5/acre	

Appendix 5—Farmland Protection Programs in a Multi-Program Policy Environment

On an intuitive level, it should come as no surprise that farmland protection programs care most about protecting farmland. Yet, from the point of view of maximizing social well being, can we make better use of our rural land protection dollars? Does a predominant goal of “protecting agricultural viability” mean grand opportunities are being missed, that potentially valuable landscapes are being lost while a lesser amount of expensive farmland is protected?

When addressing this question, it is important to consider both the value of the various rural amenities, and the breadth of programs devoted to the protection of rural resources. Ultimately, what matters is the full set of rural amenities that are protected by this spectrum of programs, and not just those protected by any single program. From this viewpoint, the ultimate goal of the government as a whole (acting in the interests of the citizenry) is to maximize the net benefits (the benefits minus the costs) from protecting rural lands.

However, this level of integration is rarely found. Rather, the responsibility for rural land protection is often broken into several programs. For example, a State-run PDR program may coexist with State-run parkland expansion programs, wildlife habitat protection programs, county-level conservation lands, and Federal programs to protect riparian buffers. All of these provide rural amenities, and many of these may seek to protect identical parcels of land.

In this policy environment, efficient decision making requires some form of two-stage decision making. That is, to avoid wasteful replication of effort, there needs to be some way of directing the actions of separate programs. In this light, consider a stylized example that highlights the implications of inter-program coordination when structuring farmland preservation programs, an example that suggests reasons why the protection of farming may be a proper focus for farmland protection programs.

For simplicity’s sake, assume there are two kinds of rural amenities. The first we call *viable ag*, the second we call *pastoral beauty*. The first is only provided by protection of active farmland,¹ while the second is provided by a variety of other rural lands, including farms. Given the wider array of lands that can provide *pastoral beauty*, we further assume that it is less

expensive to protect a unit of pastoral beauty than it is to provide a unit of *viable ag*.²

Furthermore, suppose the existence of two independent programs whose mission is to protect rural landscapes:

- 1) An active farmland protection program (AFPP). The AFPP can protect either active farmland (providing *viable ag*), or other rural lands such as lightly used pastureland and woodlots (providing *pastoral beauty*)
- 2) A rural lands conservation program (RLCP). The RLCP can protect the same types of land as the AFPP.

Appendix figure 5.a depicts the information available to both program directors. Before the programs commence, both *viable ag* land and *pastoral beauty* are underprovided—the amenity value they provide is lower than the cost of provision.³ Although the value of an additional unit of *viable ag* is higher than a unit of *pastoral beauty*, so is the price. Thus, as shown by the crosshatched rectangle, the net value of a dollar spent on *viable ag* will be less than a dollar spent on *pastoral beauty*.⁴

Ideally, land should be protected until A_{opt} units of *viable ag* and B_{opt} units of *pastoral beauty* are obtained. However, assuming both programs are operating with a limited budget, decisions must be made on how much of each amenity to protect.

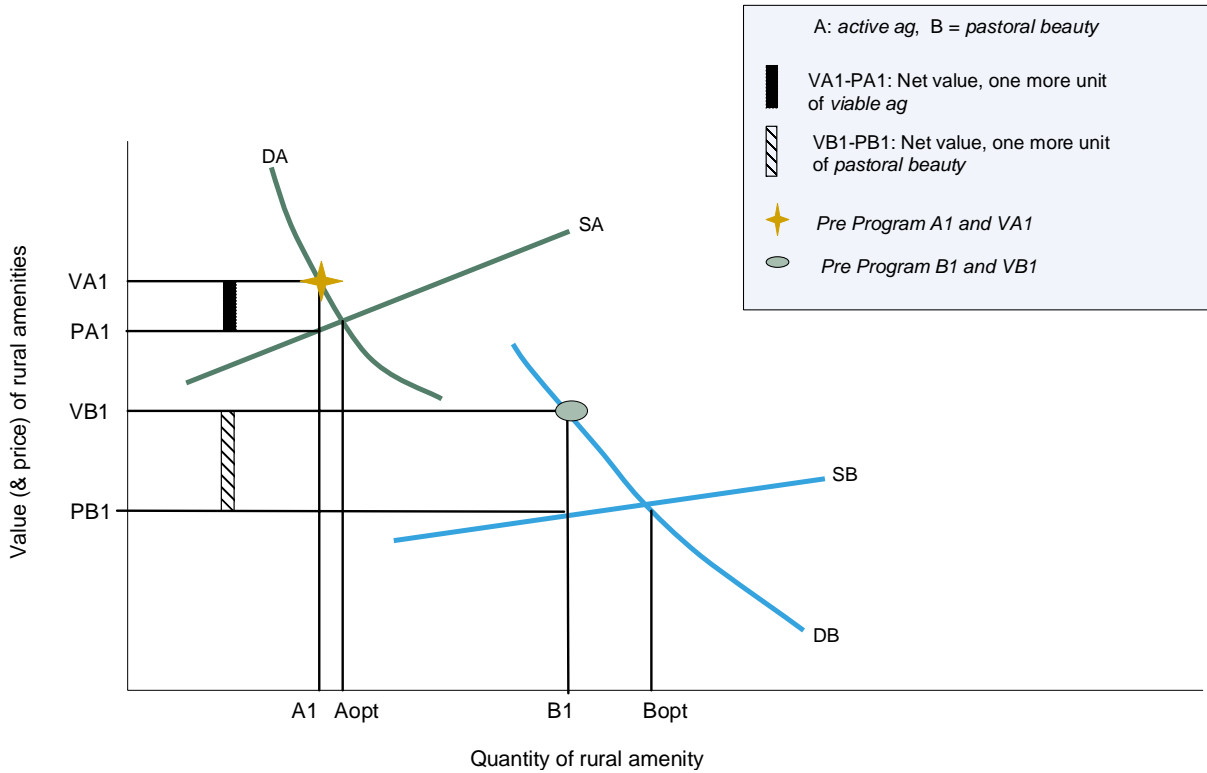
¹ For this exercise, we abstract from the different kinds of farmland.

² As a simplification, assume that 1 acre of farmland provides one unit of the “active agriculture” amenity. Similarly, 1 acre of rural open space (whether it be farmland, pastureland, or woodlot) can provide one unit of “pastoral beauty.”

³ The amenity values are depicted in the demand curves (DA and DB). The cost of provision is depicted in the two supply curves (SA and SB). We assume that there is a one-to-one match between acres and units of the amenity provided by these acres.

⁴ A fully specified comparison would require computation of the inframarginal value net of costs (taking into account the differences in quantities purchased with the same expenditure). However, in this example such a full computation will yield the same qualitative stories (a full story increases the differences between net values per dollar expenditure).

Pre-Program: Supply and demand



The manager of the AFPP, acting independently and seeking to maximize social benefits, would use the information in appendix figure 5a to conclude that the AFPP’s limited dollars should be spent on providing pastoral beauty. Similarly, the manager of the RLCP will conclude the same. The net result of these two “uncoordinated” decisions is depicted in appendix figure 5.b. No additional units of *viable ag* are protected, while *pastoral beauty* is almost at its optimum. Unfortunately, too much *pastoral beauty* was protected: the marginal net value of *pastoral beauty* is now smaller than the marginal net value of *viable ag*.

Now consider a two-stage process, wherein a first-stage decision-maker instructs each program manager to more heavily weigh a particular amenity (i.e., the AFPP gives more weight to *viable ag* when considering acres to protect). Then, the RLCP will not change (it will still *protect pastoral beauty*). However, the AFPP will eschew the seemingly more cost-effective acres providing *pastoral beauty* and purchase *viable ag* instead.

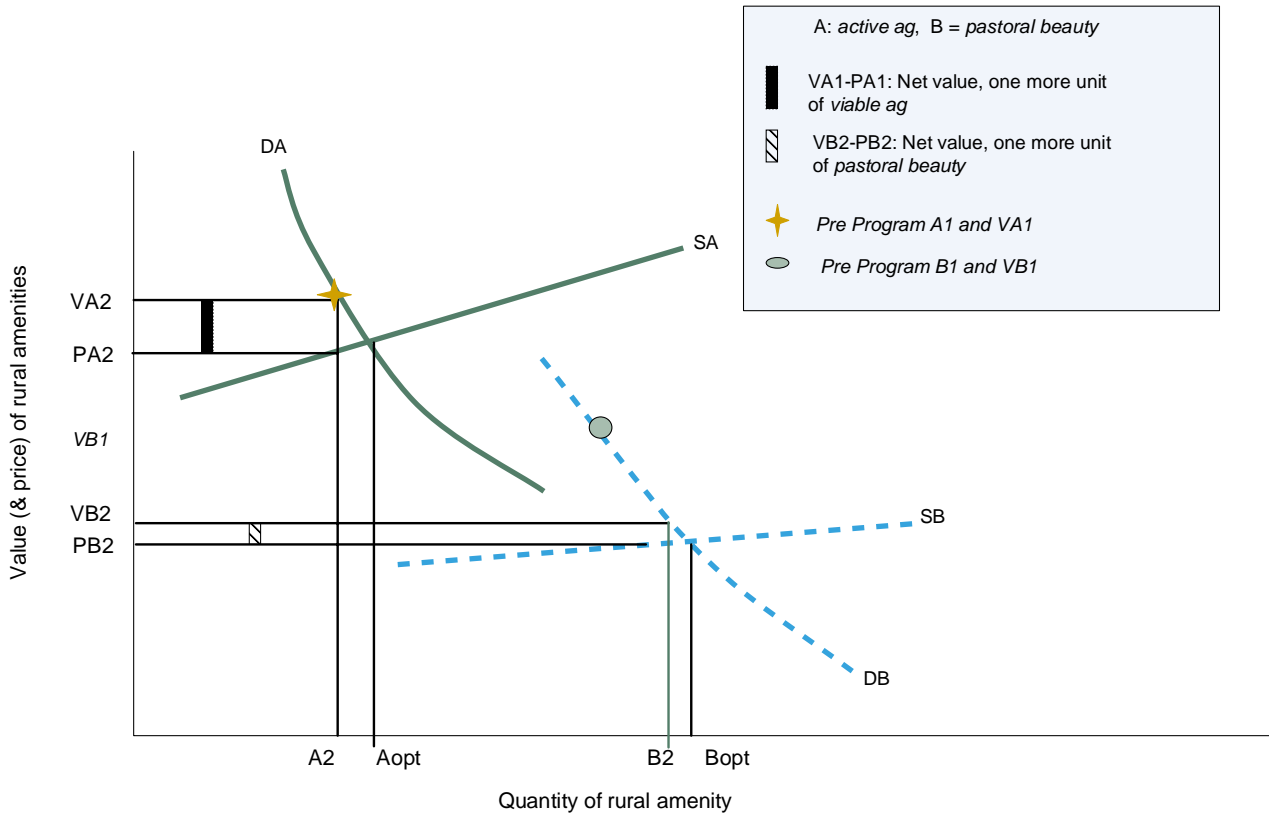
Appendix figure 5.c illustrates this scenario. The marginal values of *viable ag* and *pastoral beauty* are equivalent, hence there would be no net gain from moving funds between programs.

Thus, by using different weightings (on what amenities are most important) in each of the two programs, a more efficient outcome is obtained. Of course, this fortuitous outcome depends crucially on a set of first-stage decisions regarding the level of funding of each program, and the set of weights adopted by each program manager. In other words, in a policy environment where different programs have overlapping but essentially independent missions, determining the right mix of funding and decision rules requires that the first-stage decision maker (the highest levels of government) consider the second-stage responses of all the program managers.

For example, appendix figure 5.d illustrates how a first-level decision rule could be derived. Here, information from appendix figure 5.a is used to determine **net value** functions for an additional unit of each amenity, computed as the difference between the demand and supply curves. This **net value** (the Y axis) is plotted against the price (the X axis). Basically, as the quantity of an amenity increases, the **net value** of an additional unit decreases—since both the marginal cost for an additional unit goes up, and the marginal value of this additional unit goes down. At the price where demand equals supply, the **net value** becomes 0.

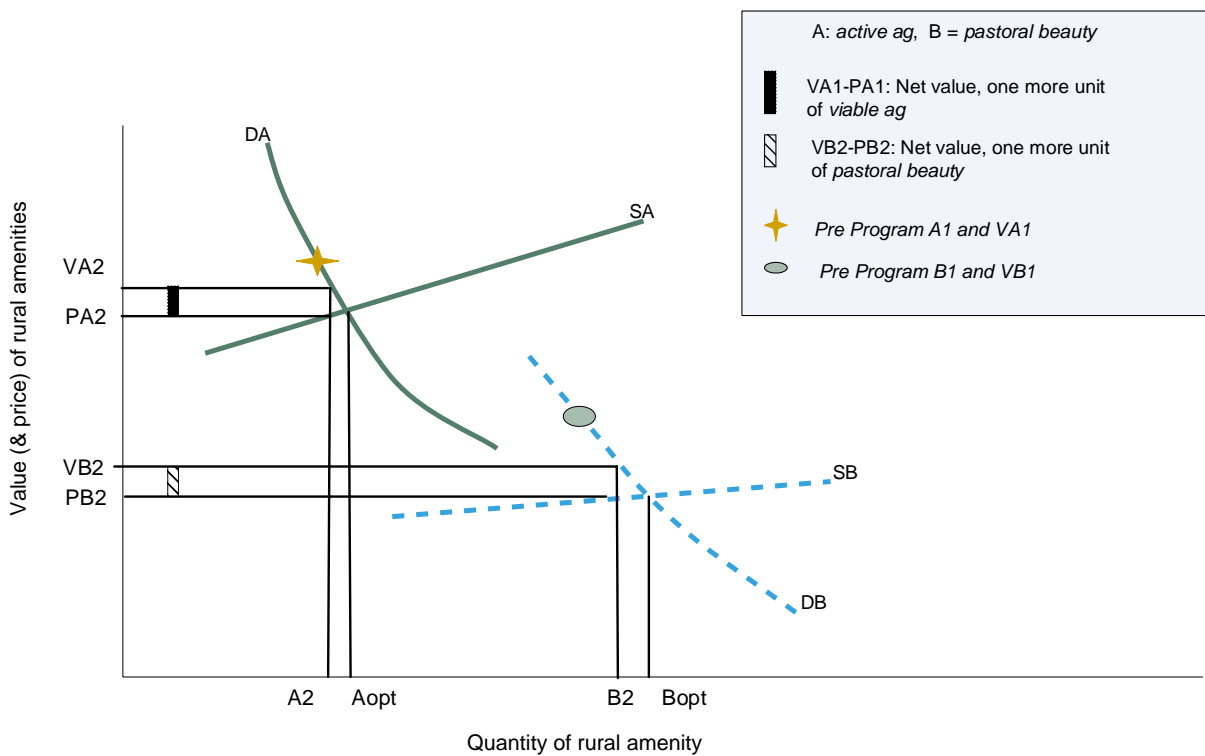
Appendix figure 5.b

Post-Program: Uncoordinated actions



Appendix figure 5.c

Post-Program: Budget constrained (coordinated) optimum



With adequate budgets, expenditures on *active ag* and *pastoral beauty* should continue until the **net value** of an additional unit is zero; which occurs at PA^* and PB^* respectively. However, when budgets are limited, social welfare is maximized when purchases of each amenity equate the **net value** per extra dollar of expenditure. This is achieved along *expenditure-rays*⁵ starting from the origin, where an intersection of a *expenditure-ray* with a **net-value** line indicates the *maximum price that should be paid for this amenity* (at this budget). Higher budgets are associated with flatter *expenditure-rays*, since flatter rays imply a willingness to pay a higher price per amenity.

The example in figure 5.d highlights that at sufficiently low budgets, it is not worthwhile to spend anything on *active ag*—the net value (per dollar of cost) for an additional unit of *active ag* is always less than the net value (per dollar of cost) for an additional unit of *pastoral beauty*. As budgets increase, the price that the govern-

ment is willing to pay for *pastoral beauty*, and for *active ag* increase, and eventually purchases of *active ag* occur.

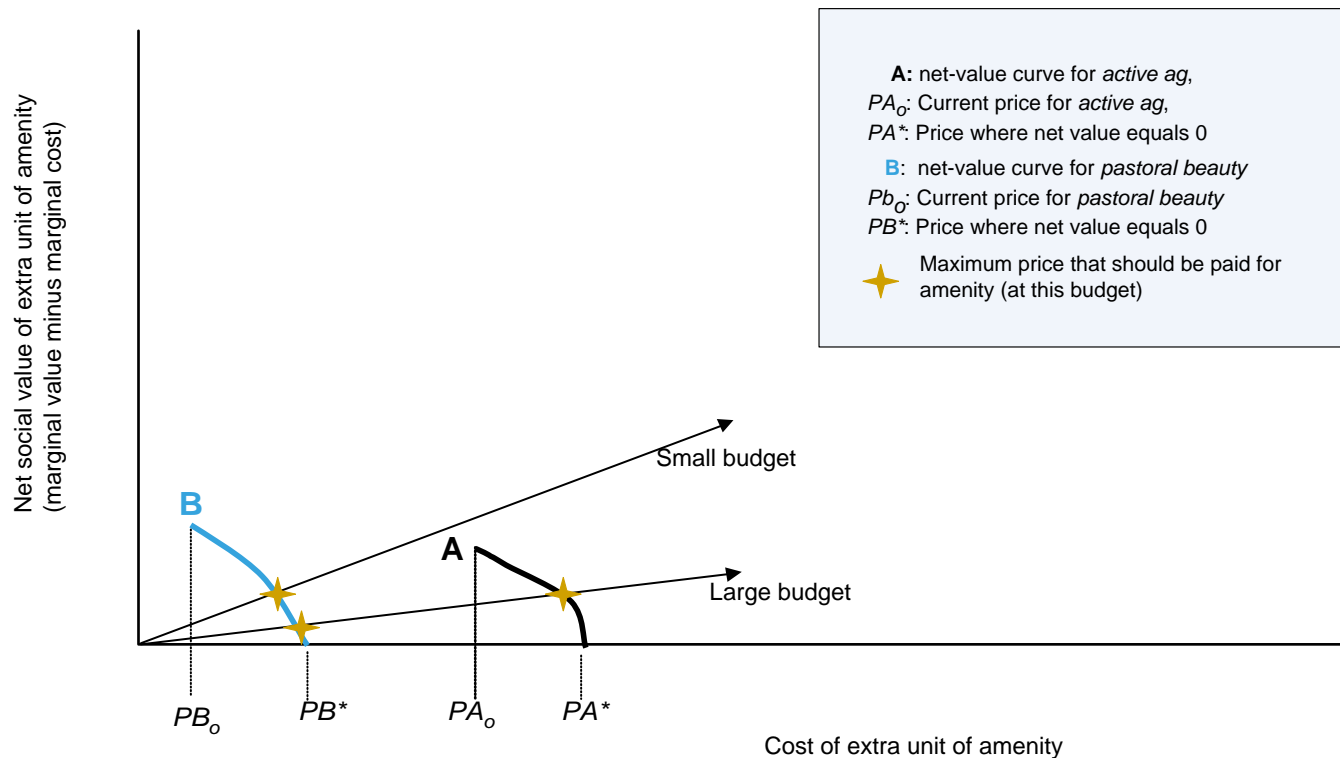
This suggests how a first-stage planner could allocate funding and set rules. For example, the different programs could be instructed to focus on one type of land only. Then, the *maximum prices* are determined by reading where a candidate *expenditure-ray*, intersects the **net-value** curves. The quantities associated with these *maximum prices* are then read from the demand curves of appendix figure 5.a. With these current and desired quantities (and the current prices and the *maximum prices*), a budget could then be allocated to each agency. Assuming one's demand and supply curves are accurate, the narrowly focused agencies will purchase the appropriate quantities of rural amenities, a quantity that maximizes net social welfare as summed across all agencies.⁶

⁵ Along an expenditure-ray, the ratio of the “net value of an amenity” and the “price for additional unit of an amenity” is constant. Thus, at the points where an expenditure-ray hits two net-value curves, the net-value for an additional dollar of expenditure is equated.

⁶ After obtaining these quantities and prices, the total dollar outlay associated with a candidate expenditure-ray can be determined. Hence, in practice the first-stage planner could iteratively examine different expenditure-rays, and then choose the one that yields a dollar outlay equal to the first-stage planner's budget. Of course, this assumes that the first-stage and second-stage planner both have the same, accurate demand and supply curves.

Appendix figure 5.d

Determining optimal allocation of funding between different rural amenities



Glossary

Active Agriculture:

In this report, “active agriculture” signifies land that is actively engaged in producing agricultural outputs. The types of rural amenities produced by land in active agriculture can differ from those produced on farmland that is not currently being used for agricultural production.

Agrarian Cultural Heritage:

This report uses “agrarian cultural heritage” to signify institutions, practices, structures, and other human components of the rural landscape that embody an agricultural way of life.

Contingent Valuation:

A survey based method used for determining the value of various environmental goods and services. Essentially, individuals are asked to state the value they have for a specific good, such as “preserving farmland.” While offering a direct measure of the public’s willingness to pay for these goods, contingent valuation can suffer from a number of biases relating to the hypothetical nature of the choice offered to respondents.

Disamenities From Agriculture:

Undesirable effects of agricultural activity. This includes odors from farms, toxic agricultural chemicals applied to crops, runoffs of farm nutrients and pesticides, erosion pollutants from croplands and general ecosystem fragmentation.

Differential (use value) Assessments:

An agricultural property tax relief program that allows eligible farmland to be assessed at its agricultural value rather than its fair market value, where fair market value reflects “highest and best use,” and is typically greater than its agricultural value.

Easements:

The right granted by an owner of one tract of land to use the land for another purpose or to leave the land in its current use.

Farmland Preservation Programs, or Farmland Protection Programs:

These are programs designed to stop or slow the conversion of farmland to other uses such as urban development. Some programs, such as use value assessment programs, may apply to all farmland in a given area, while others, such as Purchase of Development Rights (PDR) programs, may use certain criteria to determine which lands to preserve (for example, rural lands close to population concentrations may be preferred, or the preservation of larger farms and blocks of farms).

Land Market:

A land market is a market in which the item being purchased and sold is land. A land market is considered to be operating properly when the sales price of land reflects the value of all goods and services that may be provided by that piece of land. This includes not only goods such as corn and wheat, which can be sold in agricultural commodity markets, but also development tracts which can be sold in the residential land market. In addition, to the extent that land prices do not reflect the values of non-market outputs of a parcel of land, then the land-market is not operating with economic efficiency.

Net Value:

The difference between the cost of providing a unit of a good, and its value to the consumer.

Non-market Goods and Services:

In the context of rural lands, when goods and services provided by land are not reflected in its sales prices, the outputs are referred to as ‘non-market’ goods and services. “Amenity” outputs such as “wildlife habitat” and “scenic views,” whose value is often not reflected in the price of a parcel of land, are examples of non-market goods and services.

Opportunity Costs:

The value of opportunities foregone as a result of a decision. For example, the opportunity cost of participating in a Purchase of Development Rights program is the sales price the landowner could have gotten, at some later date, from a land developer.

Pastoral Beauty:

This report uses “pastoral beauty” to signify aesthetically pleasing rural landscapes. For example, a well-tended pasture, with stone fences and classic barns, provides scenery that many find pleasant to look at.

Purchase of Development Rights (PDR) and Purchase of Agricultural Conservation Easements (PACE):

A program in which a landowner voluntarily agrees to sell the rights to develop his or her land to a public agency or non-governmental organization. Once the rights are sold, a restriction is put on the deed to the parcel preventing development and non-agricultural use of the land. The landowner retains ownership and all other rights associated with the land. The price of development rights is typically estimated at the difference between the unrestricted (market) value of the parcel and its restricted (agricultural) value as determined by appraisals, or by easement valuation “point” systems.

Rural Amenities:

These are socially desirable goods and services other than food and fiber, that are generated by agricultural land. Some of the most representative examples of these goods and services are “scenic views,” “an agrarian cultural heritage,” and “wildlife habitat,” but broadly speaking, rural amenities encompass a variety of desirable goods and services that require a rural setting that cannot be reduced to a transfer of a commodity.

Rural Land Conservation Programs:

The suite of programs designed to maintain rural land uses. Farmland protection programs are an example of a rural land conservation program. Other examples include purchase of parkland, forestland conservation, and watershed protection programs.

Sending and Receiving Areas:

These terms are typically used in conjunction with transfer of development rights (TDR, see below) programs. In TDR programs, landowners in designated ‘sending areas’ are allowed to sell development rights to developers, who purchase development rights and use them to develop at densities higher than what is allowed by underlying zoning in the ‘receiving area’ where growth is desired.

Transferable Development Right (TDR):

A program in which a landowner located in a government-designated “sending zone” voluntarily agrees to sell the rights to develop his or her land to a private party, such as to a developer. Developers purchase the rights and “transfer” them to build at higher densities in “receiving zones”, which are areas the government has zoned for increased development. Once the rights are sold, an agricultural conservation easement is attached to the deed of the sending parcel permanently preventing development and non-agricultural use of the land. The landowner retains ownership and all other rights associated with the land. The price of development rights is negotiated between the developer and the landowner.

References

- Adelaja, Adesoji, and Keith Friedman. "A Political Economy of Right-to-Farm." *Journal of Agricultural and Applied Economics*, Vol. 31 No. 3, December 1999, 565-579.
- American Farmland Trust, *Saving American Farmland: What Works*, 1997. AFT Publications Division, Herrick Hill, One Short Street, Northampton, MA 01060, 1-334. Updated (2002) information was obtained from Don Buckloh at AFT.
- American Farmland Trust, January 2002. Status of State PACE Programs at <http://www.farmland.org>
- Anderson, William D., et al. "Perspectives on Agricultural Land Policy." *Journal of Soil and Water Conservation*, Vol. 30, No. 1, 1975, 36-43.
- Barnard, C.H., G. Whitaker, D. Westenbarger, and M. Ahearn. "Evidence of Capitalization of Direct Government Payments into U.S. Cropland Values." *American Journal of Agricultural Economics*. Vol. 79 No. 5, 1997, 1642-1650.
- Barnard, Charles. "Urbanization Affects a Large Share of Farmland." *Rural Conditions and Trends*. Vol. 10 No. 20, June 2000, 57-63.
<http://www.ers.usda.gov/publications/rcat/rcat102/rcat102k.pdf>
- Beasley, S., W. Workman, and N. Williams. "Amenity Values of Urban Fringe Farmland: A Contingent Valuation Approach." *Growth and Change*, Vol. 17 No. 4, 1986, 70-78.
- Bergstrom, J. C. "Expanding the Landscape Values" A Working Paper. University of Georgia. 1998.
- Bergstrom, T. C., R.P. Goodman. "Private Demands for Public Goods." *American Economic Review*. Vol. 63, 1983, 280-296.
- Black, D. *The Theory of Committees and Elections*. Cambridge University Press, Cambridge, MA, 1958.
- Bowers, Deborah (editor). *Farmland Preservation Report*. Vol. 7, No. 8, June 1997, 1-8. Bowers Publishing, Inc. 900 La Grange Rd., Street, MD 2115.
- Bowker, J. M., and D. D. Didychuk. "Estimation of Nonmarket Benefits of Agricultural Land Retention in Eastern Canada." *Agricultural and Resource Economics Review*, October 1994, 218-225.
- Boyle, Kevin, Robert Peterson, Mary Ahearn, Anna Alberini, John Bergstrom, Larry Libby, and Michael Welsh. "Improved Information in Support of a National Strategy for Open Land Policies: Summary of Focus Group Findings, Summer 2000." Staff Paper. Maine Agricultural and Forest Experiment Station, February 2001.
- Claassen, Roger, Leroy Hansen, Mark Peters, and others. "Agri-Environmental Policy at the Crossroads: Guideposts on a Changing Landscape." Agricultural Economic Report No. 794, Economic Research Service, USDA, January. 2001.
- Clawson, M., and W. Harrington. "The Growing Role of Outdoor Recreation." in Frederick, K.D. and R.A. Sedjo (editors) *America's Renewable Resources: Historical Trends and Current Challenges*. Resources for the Future, Washington, DC, 1991
- Cornes, Richard, and Todd Sandler. *The Theory of Externalities, Public Goods, and Club Goods*, 2nd Ed. Cambridge University Press, Cambridge. 1996.
- Cropper, Maureen, William Evans, Stephan Berardi, Maria Dulca-Soares, and Paul Portney. "The Determinants of Pesticide Regulation: A Statistical Analysis of EPA Decision Making." *Journal of Political Economy*, Vol. 100, No. 11, 1992. 173-197.
- Crosson, P. "Agricultural Land: A Question of Values." *Agriculture and Human Values*. Fall 1985, 1-12.
- Daniels, Tom, and Deborah Bowers. *Holding Our Ground: Protecting America's Farms and Farmland*. Island Press, Washington, DC, 1997.
- Dillman, Buddy, and John Bergstrom. "Measuring Environmental Amenity Benefits of Agricultural Land." Chapter 14 of *Farming the Countryside: An Economic Analysis of External Costs and Benefits*, Melksham, Hanley, N. (ed.). UK, Redwood Press, 1991.
- Duffy-Deno, Kevin T. "The Effects of State Parks on County Economics of the West." *Journal of Leisure Research*, Vol. 29 No. 2, 1997, 201-224.
- Joshua M. Duke and Rhonda A. Hyde. "Identifying public preferences for land preservation using the analytic hierarchy process." *Ecological Economics*, Vol. 42 No.2, 2002, 131-145.
- Falkinger, Josef, Ernst Fehr, Simon Gächter, and Rudolf Winter-Ebmer. "A Simple Mechanism for the Efficient Provision of Public Goods: Experimental Evidence." *American Economic Review*, Vol. 90 No. 1, March 2000, 247-264.

- Feather, Peter, and Charles H. Barnard. "Retaining Open Space with Purchasable Development Rights Programs." Accepted for publication, *Review of Agricultural Economics*, 2003, in press.
- Fedkiw, John. "The Evolving Use and Management of the Nation's Forests, Grasslands, Croplands, and Related Resources." USDA Forest Service. General Technical Report RM-175. September 1989.
- Fredrick, K.D., and Roger A. Sedjo, "Overview: Renewable Resource Trends" in Frederick, K.D. and R.A. Sedjo (editors) *America's Renewable Resources: Historical Trends and Current Challenges*. Resources for the Future, Washington, DC, 1991.
- Furuseth, Owen. "Public Attitudes Toward Local Farmland Protection Programs." *Growth and Change*, 1987, 49-61.
- Gardner, Delworth. "The Economics of Agricultural Land Preservation." *American Journal of Agricultural Economics*, Vol. 59 No. 5, December 1977, 1027-1036.
- Glendening, Governor Parris. Green Print Announcement, Wayson's Corner, Monday, August 13, 2001.
- Groves, T., and J. Ledyard. "Optimal allocation of public goods: a solution to the "free rider" problem." *Econometrica* Vol. 45, 1997, 783-809.
- Halstead, J., 1984, "Measuring the Nonmarket Demand Value of Massachusetts Agricultural Land: A Case Study," *Journal of the Northeastern Agricultural Economics Council*, Vol. 13 No. 1, 12-19.
- Hanley, Nick. "Farming and the Countryside: An Economic Analysis of External Costs and Benefits." CAB International, Wallingford UK. 1991.
- Heimlich, Ralph, and W. D. Anderson 2001. "Development at the Urban Fringe and Beyond: Impacts on Agriculture and Rural Land." Agricultural Economic Report No. 803. Economic Research Service, USDA, 2001.
- Hewitt, Julie, and Daniel Brown. "Agency costs in environmental not-for-profits." *Public Choice*, Vol. 103, 2000, 163-183.
- Irwin, Elena G. and Nancy E. Bockstael. "The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values." *American Journal of Agricultural Economics* Vol. 83 No. 3, August 2001, 698-704.
- Jacobstein, J. Myron, and Roy M. Mersky. *Fundamentals of Legal Research*, The Foundation Press, Inc., 1977, Mineola, N.Y.
- Kahn, Matthew, and John Matsusaka. "Demand for environmental goods: Evidence from voting patterns on California Initiatives", *The Journal of Law and Economics* Vol. 40, April 1997, 137-173.
- Kline, Jeffery, and Dennis Wichelns. "Using Referendum Data to Characterize Public Support for Purchasing Development Rights to Farmland." *Land Economics* Vol. 70 No. 2, April 1994, 223-233.
- Kline, Jeffery, and Dennis Wichelns. "Public Preferences Regarding the Goals of Farmland Preservation Programs." *Land Economics* Vol. 72 No. 4, November 1996, 538-549.
- Kline, Jeffery, and Dennis Wichelns. "Measuring Public Preferences for the Environmental Amenities Provided by Farmland." *European Review of Agricultural Economics*, Vol. 23 No. 4, 1996, 421-436.
- Kreiger, Douglas. "Saving Open Spaces: Public Support for Farmland Protection", Working Paper Series wp99-1, Center for Agriculture in the Environment, April, 1999.
- Kunkle, Fredrick. *Washington Post*, C-3, May 13, 2001.
- Laffont, J.L., and E. Maskin. "The Theory of Incentives: An Overview", in *Advances in Economic Theory: Invited Papers of the Fourth World Congress of the Econometric Society*, edited by W. Hildenbrand. Cambridge University Press, Cambridge, MA, 1982.
- Ledyard, J. "Public Goods: A Survey of Experimental Research", in *The Handbook of Experimental Economics*, edited by A. Roth and J. Kagel. Princeton University Press, Princeton, NJ, 1995.
- Lewandrowski, J., and K. Ingram. 1999. "Policy Considerations for Increasing Compatibilities between Agriculture and Wildlife" *Natural Resources Journal*. Vol. 38 No. 2, 1999, 229-69.
- Lynch, Lori and Wesley N. Musser. "A Relative Efficiency Analysis of Farmland Preservation Programs." *Land Economics*, Vol. 77 No. 4, November 2001, 577-594.
- Margolis, H. *Selfishness, Altruism, and Rationality*. Cambridge University Press, Cambridge, MA, 1992.
- Massachusetts Department of Food and Agriculture. "APR News." Summer 1997. Massachusetts Dept of Food and Agriculture, Lancaster MA.

- McFadden, Daniel. "The Revealed Preference of a Public Bureaucracy: Theory." *The Bell Journal of Economics*, Vol. 6, Autumn 1992, 401-416.
- McLeod, Donald, Jody Woithay, and Dale Menkhaus. "Factors Influencing Support for Rural Land Use Control: A Case Study." *Agricultural and Resource Economics Review* Vol. 28 No. 1, April 1999, 44-56.
- Migue, J.L., and G. Belanger. "Towards a general theory of managerial discretion." *Public Choice* Vol. 17, 1974, 27-47.
- Mitchell, John. "Urban Sprawl" *National Geographic* July 2001.
- Mullarkey, Daniel, Joseph Cooper, and David Skully. "Do Mixed Goals Distort Trade." *Choices*, First Quarter 2001, 32-34.
- Myers, Phyllis, and Robert Puentes.. "Growth at the Ballot Box: Electing the Shape of Communities in November 2000." Brookings Institute Discussion Paper, Feb 2001. <http://www.brook.edu/urban>.
- National Parks Conservation Association (NPCA). "A Primer on Federal Land," http://208.226.12.12/about_npca/parksystem.asp.
- National Association of State Park Directors (NASPD). "A Statistical Report of America's State Parks" <http://www.indiana.edu/~naspd/research/rpainventory.html>.
- New York State Library, <http://www.nysl.nysed.gov/legint.html>.
- Nickerson, Cynthia J. and Lori Lynch. "The Effect of Farmland Preservation Programs on Farmland Prices." *American Journal of Agricultural Economics*, Vol. 83 No. 2, 2001, 341-351.
- Nickerson, Cynthia J. "Characterizing Participation in Farmland Preservation Programs." Ph.D. dissertation, Department of Agricultural and Resource Economics, University of Maryland, College Park, MD, June 2000.
- Niskanen, W. A. "A reflection on bureaucracy and representative government", in *The Budget Maximizing Bureaucrat: Appraisals and evidence*, edited by A. Blair and S. Dion. University of Pittsburgh Press, Pittsburgh, 1991.
- Pierce Neal R. "Sprawl: Lost Campaign Issue?" Syndicated September 10, 2000. Published in Detroit Free Press and other periodicals.
- Pierotti, D. Dewey Jr. Letters to the Editor, *Chicago Tribune*, sect. 1, September 12, 2000.
- Pfeffer M.J., and M.B. Lapping. "Public and Farmer Support of Purchase of Development Rights in the Metropolitan Northeast." *Journal of Soil and Water Conservation*, January-February, 1995, 33.
- Pfeffer, M.J., and M. B. Lapping, "Farmland Preservation, Development Rights and Theory of the Growth Machine: The Views of Planners." *Journal of Rural Studies*, 1994, 233-248.
- Quiggin J. 1997. "Altruism and Benefit Cost Analysis." *Australian Economic Papers*, Vol. 36 No. 68, June 1997, 144-55.
- Ready, Richard, Mark Berger and Glen Blomquist. "Measuring Amenity Benefits From Farmland: Hedonic Pricing vs. Contingent Valuation." *Growth and Change*, Vol. 28 No. 4, 1997, 438-458.
- Reichelderfer, K. and R.A. Kramer. "Agricultural Resource Policy," in Gerald Carlson, David Zilberman, and John Miranowski, editors, *Agricultural and Resource Economics*. 1993, Oxford University Press, NY, NY.
- Rivedal, Karen, *Florida Times Union*, page 1, December 26, 2000.
- Rondeau, William, William Schulze, Gregory Poe. "Voluntary revelation of the demand for public goods using a provision point mechanism." *Journal of Public Economics* Vol. 72, 1999, 455-470.
- Rosenberger, Randall, and Richard Walsh. "Nonmarket Value of Western Valley Ranchland Using Contingent Valuation." *Journal of Agricultural and Resource Economics*, Vol. 22 No. 2, 1997, 296-309.
- Sanders, Steve. "Curbing Sprawl with Smart Growth." *California Country*, May-June 1999
- Samuleson, Paul. "The Pure Theory of Public Expenditure." *Review of Economics and Statistics*, Vol. 36 No. 4, November 1954, 387-389.
- Sedjo, Roger A. "Forest Resources: Resilient and Serviceable" in Frederick, K.D. and R.A. Sedjo *America's Renewable Resources: Historical Trends and Current Challenges*. Resources for the Future, Washington, DC, 1991.
- Shi, Y.J., T. Phipps, and D. Colyer. "Agricultural Land Values Under Urbanizing Influences." *Land Economics*. Vol. 73 No. 1, February 1997, 90-100.

- Solberg, Erling, and Ralph Pfister. "Rural Zoning in the United States: Analysis of Enabling Legislation." USDA Economic Research Service Miscellaneous Publication No. 1232, 1972.
- Steel, Jennifer. *Losing Ground (2nd edition)*. Massachusetts Audubon Society, May 1999.
- Stevens, J. *The Economics of Public Choice*. Westview Press, Boulder CO, 1993.
- U.S. Department of Agriculture, Natural Resource and Conservation Service, 2001.
<http://www.info.usda.gov/nrcs/fpcp/fpp.htm>
- U.S. Department of Commerce, Bureau of Census. 1990 Census of the Population and Housing.
- U.S. Department of Commerce, Bureau of Census. 1987 Census of Agriculture.
- U.S. Department of Commerce, Bureau of Census. 1992 Census of Agriculture.
- U.S. Department of Commerce, Bureau of Census. 1997 Census of Agriculture.
- Variyam, Jayachandran, Jeffery Jordan, and James Epperson. "Preferences of Citizens for Agricultural Policies: Evidence from a National Survey." *American Journal of Agricultural Economics* Vol. 72 No. 2, May 1990, 257-267.
- Vandell, Kerry, and Stephen Malpezzi. "Analyzing the Gap Between Myth and Reality." *Common Ground*, Fall 1999. <http://www.oncommonground.org/archive/1299/front1.htm>.
- Vesterby, Marlow, and K. S. Krupa. "Effects of Urban Land Conversion on Agriculture." *Urbanization and Development Effects on the Use of Natural Resources*. E. Thumberg and J. Reynolds, eds. SRDC-169 Southern Rural Development Center and the Farm Foundation, Mississippi State University, 1993.
- Vesterby, Marlow, and Kenneth S. Krupa. *Major Uses of Land in the United States, 1997*. SB-973. USDA Economic Research Service, August 2001.
- Vesterby, Marlow, and Kenneth S. Krupa. *Major Land Uses (data, 1945-97)*. <http://www.ers.usda.gov/data/majorlanduses/>, 1997.
- Weingast, Barry, and Mark Moran. "Bureaucratic Discretion or Congressional Control? Regulatory Policy-making by the Federal Trade Commission." *Journal of Political Economy*, Vol. 91, October 1983, 765-800.
- Wiebe, Keith, Ababayehu Tegene, and Betsey Kuhn. "Partial Interests in Land: Policy Tools for Resource Use and Conservation." Agricultural Economic Report No. 744, Economic Research Service, USDA, November 1996.
- Whyte, William. *The Last Landscape*. Doubleday & Company, Garden City, NY, 1968.
- Woods, N., C. Halbrendt, K. Liang, and Q Wang. "Interdependence of Agriculture and Tourism: Quantifying the Value of the Agricultural Working Landscape in Vermont," paper presented at AAEE annual meeting, July 30-August 2, 2000, Tampa, FL.
- Yates, Andrew, Richard Stroup. "Media coverage and EPA pesticide decisions." *Public Choice* Vol. 102, 2000, 297-312.