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Protecting Rural Amenities Through Farmland Preservation Programs

Cynthia J. Nickerson and Daniel Hellerstein

We investigate what farmland preservation programs reveal about the importance of protecting different rural amenities. An extensive content analysis of the enabling legislation of various farmland protection programs suggests wide variation exists in the protection of amenities. An analysis of 27 individual Purchase of Development Rights (PDR) programs' selection criteria suggests these programs favor preserving amenities that are jointly provided by cropland and livestock operations. These PDR selection criteria also reveal unique preferences regarding the spatial patterns of preserved agricultural lands. Variation in relative weights given to protecting most parcel characteristics in PDR programs is not easily explained by factors that characterize areas experiencing farmland losses.

Key Words: farmland preservation, rural amenities

Despite the relatively small fraction of the American landscape dedicated to 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. Individual states now spend millions of dollars annually to protect farmland, through such mechanisms as use value assessments and Purchase of Development Rights (PDR) programs. The 2002 Farm Bill provides evidence of growing concerns at the federal level. Funding for the federal farmland protection program increased more than ten-fold, from about \$53 million total for the six years 1996–2001 to nearly \$600 million total over the six years beginning in 2002.

While interest in protecting farmland may arise in part from desires to maintain agricultural activity, the existence of federal programs to limit

agricultural production, such as the Conservation Reserve Program, suggests reasons not directly related to agricultural production may also be important—such as the desire to maintain “rural amenities” associated with agricultural land uses (e.g., scenic views, wildlife habitat, agrarian cultural heritage, and open space). Although the effectiveness of farmland protection programs in addressing sprawl prevention concerns is beginning to receive attention (Heimlich and Anderson, 2001; Nickerson, 2001), few studies have provided a comprehensive assessment of what rural amenities are likely to be protected through farmland protection programs.

In this paper, we seek to increase our understanding of the rural amenities protected through farmland protection programs, and how the provision of these amenities varies across the country. We do this by examining farmland protection program legislation, and the methods used by one type of program to prioritize parcels for preservation. Underlying this research is the desire to understand what positive benefits, including the provision of rural amenities, are sought by and provided to the public through farmland protection programs. However, as government programs could very well be influenced by interests other than the general public's preferences (e.g., farmer interest groups' preferences), examination of farmland protection

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programs is unlikely to yield precise measures of the public preferences for different rural amenities.

Most of the existing research on farmland protection programs and amenities has focused on people's willingness to pay to protect varying amounts of farmland using contingent valuation methods (Bergstrom, Dillman, and Stoll, 1985; Beasley, Workman, and Williams, 1986; Halstead, 1984; Bowker and Didychuk, 1994; Rosenberger and Walsh, 1997), or their willingness to pay to live on or near protected farmland as revealed via hedonic approaches (Irwin and Bockstael, 2001). While these studies consistently conclude that people are willing to pay to protect farmland (and do so, as observed through increased property prices of adjacent houses), much less is understood about exactly what objectives people seek when they support farmland protection programs.

One study that did examine public preferences regarding the goals of farmland preservation was conducted by Kline and Wichelns (1996). In a survey of Rhode Island residents, they found more support for protecting groundwater, wildlife habitat, and natural places than agricultural objectives such as protecting local food supplies or maintaining a farming heritage. In an extended study using the same data, Kline and Wichelns (1998) also found that on average, Rhode Island residents preferred preserving fruit and vegetable farmland with public access, woodland without public access, and fruit and vegetable farmland without public access—but these preferences varied depending on whether respondents had environmentally oriented attitudes, preferences for maintaining rural character and open space, or farming-oriented attitudes.

Survey results in one county in North Carolina revealed support for farmland preservation programs arose as much from desires to protect food supplies and farming heritage as from a desire to protect the environment by keeping land in open space (Furuseth, 1987). In Chicago collar counties, the most important reasons focus groups identified for protecting farmland were ensuring future food supplies, protecting family farms, and controlling development (Krieger, 1999). In a Delaware survey, the most important reasons for protecting land included maintaining the agricultural way of life, access to locally grown products, and protecting water quality (Duke and Hyde, 2002).

In addition to being restricted in scope (i.e., only residents from one county or state are surveyed), these studies provide limited information about how

context-specific circumstances affect survey outcomes. For example, in any given area, the number and types of programs that exist to protect rural lands are numerous and complex, and may have overlapping objectives. Respondents would have to be remarkably well informed about the plethora of programs and their competing or overlapping goals to be able to express preferences over goals of any single rural land protection program in a survey.

Also, the extent of land remaining in agriculture at the time of the survey can be expected to influence stated preferences about farmland preservation goals. For example, only 7% of the land in Rhode Island was in a farming use when that survey was conducted (Kline and Wichelns, 1996). Agriculture was a predominant land use in the Chicago collar county study area (Krieger, 1999). In the North Carolina study, one-third of the county was urbanized (Furuseth, 1987). Further, the presence of other institutions affecting rural land preservation, as well as a limited understanding of development patterns and rates, could contribute to difficulties researchers report survey respondents experience when asked to trade off which farmland attributes ought to be protected specifically through farmland preservation programs.

Our goal is to investigate what the farmland protection programs reveal about the importance of rural amenities. In doing so, we take a broad view, and consider programs in place across the country. We adopt an approach based in the economics of public choice which describes how public preferences influence government program design.

First, decisions of idealized farmland preservation agencies are modeled, demonstrating how public preferences influence the decision process of which amenities to protect, and also how the presence of other rural land protection programs affects decisions. We then model the decisions made by agencies administering a particular type of voluntary farmland preservation program, namely a Purchase of Development Rights program (also known as Purchase of Agricultural Conservation Easement program). This model demonstrates how the agency's method for choosing which parcels to preserve in a voluntary program can reveal information on the relative importance of protecting different parcel characteristics, which, in turn, determines the types of amenities most likely to be protected.

The analysis of data involves two approaches. Using a content analysis approach, enabling legislation is examined for a wide variety of farmland

protection programs in the lower 48 states. This analysis reveals the extent of spatial variation in objectives, and the array of rural amenities that states seek to protect through these programs. Then, using data on 27 individual PDR programs, we investigate variation in the relative weights placed on various farmland attributes. Although the analysis does not lend itself to definitive conclusions on the values individuals have for different amenities, we are able to offer some general findings on the importance of the various types of amenities most likely to be preserved in farmland preservation programs.

Background: Rural Amenities, Public Goods, and Farmland Protection

Broadly defined, rural amenities encompass a variety of goods and services that provide utility to consumers, and whose provision requires a rural setting. Rural settings refer to lands that begin at the edges of cities, where the landscape is not dominated by human settlement.¹ Agriculture and forestland are examples of predominant land uses one would find in a “rural setting.”

What distinguishes the goods and services we call “rural amenities” is that a rural landscape is involved in their production. Generic commodities like bushels of corn purchased from the market are not considered to have “rural amenity” value, even though they are likely to have been produced in a rural setting—because the value of such commodities is derived from attributes such as the nutritional content and flavor of the corn, and not specifically from where it was produced.

Many rural amenities have the distinction of not being readily tradable in markets. A number of these goods and services, such as scenic farm views or the agrarian cultural heritage of an area, have a public goods nature and are distinguished by non-excludability and nonrivalness in consumption.

The potential underprovision of rural amenities from agricultural land arises because of their public goods nature. When rural amenities are nonexcludable, the owners of rural lands will be unable to profit from their production, because consumers are not required to compensate the producer for their consumption of the amenity. If rural landowners

could capture the value of rural amenities (i.e., if they could require consumer payment), the profitability of maintaining their land in a farming use would be increased. This would tend to postpone conversion of the farmland to nonfarm uses, since alternative uses would have to generate higher income streams in order to bid the land away from a farming use.

Alternatively, even if rural landowners could sell rural amenities to individual consumers, to the extent rural amenities are nonrival in consumption, they will be underprovided. Individuals purchasing a rural amenity will only consider their own well-being when assessing tradeoffs between this rural amenity and other commodities, even though their purchase of a rural amenity would provide a good which can be enjoyed by all. Consequently, each individual would choose to purchase too small an amount of the rural amenity relative to the social optimum (Samuelson, 1954).

Several mechanisms have evolved to help correct the market failure that arises when rural lands are developed too soon. These include private (non-governmental organization) initiatives such as private rural land trusts, formed to accept charitable donations of rural lands—the entire interest in the land, or a partial interest such as the development rights associated with the land. These mechanisms also include initiatives where a set of individuals join together to collectively protect farmland. Under some circumstances, this latter strategy can result in the efficient provision of rural amenities. For example, when amenities are highly localized, the flow of benefits could be retained by a limited group. An illustration would be the decision to subdivide a farmed parcel and situate house lots in a circular pattern around a core of open land containing the original farm buildings, which continues to be farmed. However, to the extent the rural amenities provided by the protected farm yield benefits (such as scenic views) to noncontributors, the problem of underprovision is likely to remain.

The most common approach to the protection of farmland is through government programs. In the next section, our models of the decisions of farmland preservation agencies are introduced. We demonstrate the role played by public preferences and illustrate why the focus of farmland protection programs is location-specific. Our discussion highlights the implications of the decisions for the protection of rural amenities through farmland preservation programs.

¹ It is useful, especially in the United States, to add another boundary—where the wildlands begin. Since “city’s edge” and “start of the wildlands” are rarely sharply delineated, this is meant to be suggestive of landscapes defined, but not dominated, by a human presence.

Conceptual Models of Rural Amenity Provision via Farmland Protection Programs

The analysis of government decisions is closely related to the economics of public choice, which postulates that voters support programs which maximize their utility (Stevens, 1993). When choosing public goods, individuals partially act as if they were making choices affecting their own consumption of goods and services (Reichelderfer and Kramer, 1993), and partially as citizens expressing their values (Margolis, 1992; Quiggin, 1997). In either case, preferences are being acted upon.

Moreover, recent research on environmental issues shows bureaucracies are responsive to the desires of their constituencies, and also that public preferences shape program design (Cropper et al., 1992; Yates and Stroup, 2000; Hewitt and Brown, 2000; Weingast and Moran, 1983). Hence, although program design and adoption may be influenced by political groups representative of farmland owners (since the programs directly affect this interest group), it is equally likely these programs are correlated with popular preferences.²

Farmland Protection Agency Decisions in Theory

When farmland protection agency decisions consider the utility individuals derive from rural amenities, as well as the presence of other protection programs that provide amenities, the decisions reveal several interesting findings regarding the types and values of amenities likely to be provided in farmland preservation programs. Although food security, urban planning, and rural development goals are also objectives of existing programs, in what follows we set these other concerns aside and focus on the provision of rural amenities as the goal of the agency's farmland protection program.³

Our stylized model starts with the notion that farmland protection occurs within a broad set of rural land conservation programs (Rosenberger, 1998). In the case of rural amenities and farmland

preservation, considering other agencies' actions is particularly important because of the existence of a plethora of other rural land preservation and conservation programs which also provide amenities.⁴ We also proceed under the premise that these programs are politically palatable to farmland owners, and assume these interest groups' preferences are not over-represented relative to the preferences of the general public in agency decisions. This approach allows us to focus attention on the effects of individual preferences for amenities on program design.

In making optimal decisions regarding farmland protection, the agencies can be expected to consider the utility individuals derive from rural amenities. Using an indirect utility function, individual utility can be modeled as a function of income, the price of "use-value" rural amenities, and the quantity of "existence-value" rural amenities. The price of "use-value" rural amenities, \mathbf{P}_i , conditions the consumption of goods and services that individual i can obtain through the purchase of indirect inputs. In particular, these include rural amenities such as "outdoor recreation" and "sightseeing," which the individual can travel to obtain (the cost of travel being the indirect input). Hence, \mathbf{P}_i are individual specific, and depend on where the individual lives relative to rural landscapes that produce these kinds of rural amenities. "Existence value" rural amenities, \mathbf{Z} , are "pure" public goods. These include "maintaining biodiversity in the local ecosystem" and "knowing that farming as a way of life continues in one's community." Since these amenities are both nonrival and nonexcludable, their quantity is the same for all individuals.

Indirect utility can be defined as:

$$(1a) \quad V_i(\mathbf{y}_i, \mathbf{P}_i, \mathbf{Z}) = \int_{t=0}^j \delta^t E[V(y_{it}; \mathbf{P}_{it}, \mathbf{Z}_t)],$$

where $\delta^t E[V(\cdot)]$ = the discounted expected indirect utility of individual i , and the expectation is with respect to future values of y , \mathbf{P} , and \mathbf{Z} ; y_{it} = a sequence (over t) of personal income values; \mathbf{P}_i = a sequence (over t) of the price vector for "use-value" rural amenities; and \mathbf{Z}_t = a sequence (over t) of the quantity vector of "existence-value" rural amenities. Prices and income are normalized by the price of a numeraire good.

² Although principal-agent factors can limit the efficiency of any government program (Niskanen, 1991), in practice, government provision of public goods is common, and may often be nearly optimal (Migue and Belanger, 1974).

³ Clearly, food security, urban planning (i.e., sprawl prevention), and rural development are often important goals of farmland protection programs. However, it can be argued (given alternative mechanisms exist to provide these benefits), that the provision of rural amenities may be the most compelling reason for farmland protection (Hellerstein et al., 2002).

⁴ A theoretical appendix that discusses optimal decision making, when several land conservation programs are active, is available from the authors upon request.

Farmland protection agencies will consider the value people place on rural amenities. The farmland protection agency seeks to maximize over all i individuals:⁵

$$(1b) \quad j \quad WTP_i,$$

where

$$V(y_{i0} \& WTP_i, \tilde{y}_i; \mathbf{P}_i^1, \mathbf{Z}^1) \quad V(y_i, \mathbf{P}_i, \mathbf{Z}).$$

Here, WTP_i is individual i 's willingness to pay to protect rural amenities, y_{i0} is the current year income, $\tilde{y}_i = y_{i1}, y_{i2}, \dots$ is the vector of future income, and \mathbf{P}_i^1 and \mathbf{Z}^1 (the sequence of \mathbf{P}_i and \mathbf{Z} , after protecting farmland) are determined by:

$$(1c) \quad \mathbf{P}_i^1 \quad \mathbf{G}_p(R^c, F^{c*}Location_i, R_0, F_0)$$

and

$$(1d) \quad \mathbf{Z}^1 \quad \mathbf{G}_z(R^c, F^{c*}R_0, F_0),$$

subject to

$$(1e) \quad M \quad \Delta F^{c*}C_F.$$

\mathbf{G}_p is a vector of functions which determine the values of the sequence of \mathbf{P}_i (where \mathbf{P}_i is a vector of prices); it depends on the expected, intertemporal distribution of farmland and other rural land types. This distribution is influenced by the current distribution of farmland (F_0) and other rural land types (R_0), and the farmland (F^*) and other rural land (R^*) currently enrolled in conservation and preservation programs.⁶ It also depends on the distribution of land uses relative to the individual's residence ($Location_i$). Similarly, \mathbf{G}_z is a vector of production functions for \mathbf{Z} . It can also depend on R and F , but does not depend on the location of an individual residence. M is the agency's budget, ΔF^{c*} denotes the farmlands protected in the current period, and C_F is the price per unit for these "protected" farms.

This model highlights the complexity of the farmland preservation agency's decision, involving expectations of utility, with the utility dependent on

both the spatial distributions of rural amenities and residence patterns. That said, a perusal of the model helps to highlight a number of points.

First, equations (1a)–(1e) formalize the notion that there is no such thing as a single "rural amenity." Rather, there are a number of rural amenities, with different types of rural lands providing them in different quantities. For example, open space and wildlife habitat can be provided by any rural lands, while pastoral scenic beauty and the cultural heritage associated with farming as a way of life are uniquely provided by farmland.⁷ In particular, we can identify a subset of "existence-value" rural amenities which are *uniquely* provided by farmland as \mathbf{Z}^f , and the prices of "use-value amenities" which are *uniquely* provided by farmland as \mathbf{P}^f . Similarly, we define amenities (and prices) that may be provided by *any* rural lands as \mathbf{Z}^r and \mathbf{P}^r , and refer to these as "generic" rural amenities (i.e., having the land in an agricultural use is not a necessary condition for providing these amenities). Thus, farmlands provide \mathbf{Z}^f , \mathbf{P}^f , \mathbf{Z}^r , and \mathbf{P}^r , while other rural lands (e.g., forests) provide only \mathbf{Z}^r and \mathbf{P}^r .

Second, when V is not additively separable, the marginal utility of rural amenity j (dV/dZ_j , or dV/dP_j) will depend on the levels of \mathbf{Z} and \mathbf{P} . In other words, the marginal values of different rural amenities are not static; they will depend on what amenities are currently available. For example, when \mathbf{Z}^f and \mathbf{Z}^r are not close substitutes, the ratio of the marginal utility from increasing generic rural amenities ($dWTP/dZ^r$) to the marginal utility of increasing uniquely agricultural rural amenities ($dWTP/dZ^f$) will diminish as R^* increases. This has implications for the focus of farmland preservation agencies. Specifically, if other protected rural lands are providing an ample quantity of \mathbf{Z}^r , welfare-maximizing farmland protection programs can be expected to focus on protecting \mathbf{Z}^f . Conversely, if R^* is small, then welfare-maximizing farmland protection programs can be expected to protect both \mathbf{Z}^f and \mathbf{Z}^r .

Third, over the long term, the production of \mathbf{Z}^f and \mathbf{Z}^r depends on the relative sizes of F^* and R^* .⁸ Consider Z^{r1} , a generic *open space amenity*. Assume farmland and other rural lands provide this *open space amenity* equally well, and assume the production of this *open space amenity* shows decreasing

⁵ This optimization problem is a simplification of an underlying maximization of a social welfare function, a function which may be nonlinear in the contributions of individual WTP.

⁶ This formulation assumes the expected intertemporal distribution of rural land uses is conditioned on current land uses (R_0 and F_0) and current land protection (R^* and F^*). A more complete model could include information on expectations of future land use (such as predicted rates of population growth).

⁷ Note, this bifurcation is a simplification of a continuum, with different rural amenities being more or less dependent on the presence of active agriculture.

⁸ This point can also apply to R_0 and F_0 , the current level of rural lands and farmlands.

returns to scale ($d^2Z^{r1}/d^2R^* < 0$, and $d^2Z^{r1}/d^2F^* < 0$). Then, the long-run change in this *open space amenity* due to an increase in protected farmland (dZ^{r1}/dF^*) will be *greater* when the level of protected nonagricultural rural lands (R^*) is *smaller* ($d^2Z^{r1}/dF^*dR^* < 0$). In contrast, consider Z^{f1} , an agricultural *agrarian cultural heritage amenity*. Since this is *not* supplied by R^* , the long-run change in this *agrarian cultural heritage amenity* due to an increase in protected farmland (dZ^{f1}/dF^*) will be independent of the current quantity of R^* ($d^2Z^{f1}/dF^*dR^* = 0$).

Fourth, the relative values of many types of rural amenities are a function of land use patterns and the geographic distribution of the population. This is captured in equations (1c) and (1d), where land use, and the location of individuals relative to the amenities produced by different land uses, will influence the current prices and quantities of different rural amenities.

Farmland Preservation Programs in Practice

Government actions directed at preserving farmlands take the form of both regulatory and voluntary approaches. Many jurisdictions utilize zoning regulations, both voluntary (e.g., agricultural districts) and involuntary (e.g., agricultural zoning). Zoning is often associated with differential assessment, which sets property taxes based on current land uses, rather than “best and highest use” values. History has shown that zoning and differential assessment rules have been modified when development pressures become sufficiently strong. Thus, they have not proven to be a dependable means of maintaining rural land uses over the long run. Outright government ownership is also a means of preserving land uses, and is a common strategy for providing amenities for which public access is essential—such as the establishment of parks as a means of providing outdoor recreational experiences. However, government purchase of farmland when it is maintained in that use is rare.

An approach in which the land is left in private ownership and generally does not allow public access includes government programs that purchase partial interests in the land. Among these are the Purchase of Development Rights (PDR) programs, which involve a voluntary agreement by the landowner to forego development of the land. In PDR programs, a government agency typically purchases all of the development rights, the rights are retired, and the landowner is paid a lump sum amount for

the rights. The landowner retains all other rights to the land. The government achieves the objective of maintaining a rural land use, but does not obtain the capability to finely manage the land.

Increasingly, farmland protection agencies are adopting PDR programs to permanently preserve farmland. PDR program managers must also make choices about which parcels of farmland best accomplish program goals. While PDR programs are voluntary and participation will depend in part on idiosyncratic differences among landowners, the programs are typically oversubscribed, thereby allowing the program manager to choose which parcels to preserve from the pool of applicants.

The conceptual model described by equations (1a)–(1e) is complex and contains information requirements that are not inconsequential for any farmland protection program. In practice, voluntary programs such as PDRs are implemented using a set of ranking criteria to choose among land parcels with varying characteristics. These ranking criteria reflect the agency’s best efforts to achieve program goals, including the protection of rural amenities.

The program manager’s problem is one of choosing parcels for preservation from a set of J applicants ($j = 1, \dots, J$), based on the highest ranked parcels according to a given ranking scheme. Adapting a simple, linear ranking mechanism used to model other conservation programs (Cattaneo et al., 2002), the decision can be characterized as:

$$(2a) \quad \text{Max}_{B_j} \sum_{j \in \Omega} B_j \left[\sum_{k=1}^K \alpha_k x_{kj} \right],$$

subject to

$$(2b) \quad \sum_{j=1}^J B_j (E_j \# M),$$

where $B_j = 1$ if a parcel is chosen for preservation, α_k is the weight assigned to the k th objective ($k = 1, \dots, K$), and x_{kj} is the j th parcel’s (or landowner’s) characteristic being weighted. The program manager chooses parcels subject to a budget constraint, where E_j is the cost of purchasing the easement (development rights) on the j th parcel, and M is the amount of government funding available for easement purchases.

Essentially, the weights (α_k) capture the contributions to social welfare from the various land characteristics. They are expressions of the relative preferences for different characteristics and amenities associated with agricultural land; they may also capture the relative scarcity of particular farm-

land attributes. To the extent equations (2a) and (2b) are an accurate “reduced form” for equations (1), optimizing these equations (given a set of offered parcels) will optimize social welfare.

Just as farmland protection program objectives are likely to vary spatially across the country, we can expect the α_k 's to vary across preservation programs. In the next section, we investigate the factors contributing to variation in these weights, and the implications for the protection of amenities and the design of farmland preservation programs.

Farmland Protection Legislation and PDR Ranking Criteria as Data

Creating farmland preservation programs involves familiar processes of government: passing enabling legislation, securing funding from general revenues or from a dedicated stream, and allocating funding through a bureaucracy. When these processes are motivated by consideration of an underlying model such as in equations (1), they can offer evidence as to what objectives and amenities produced by farmland are considered the most important to preserve.

Examination of PDR ranking mechanisms can reveal the relative importance of protecting different parcel characteristics and their associated rural amenities. Although not motivated exclusively by public preferences for amenities, each of the steps that occur in the creation and implementation of farmland protection programs reveals something about which amenities are considered to be the most important to protect. Hence, we examine these programs for evidence as to what rural amenities are most likely to be protected, and how these vary as socioeconomic and geophysical factors vary.^{9,10}

We analyzed two strands of evidence provided by government programs designed to protect farmlands. First a content analysis was conducted of the enabling legislation of state-level agricultural land protection programs. This approach yielded infor-

mation on the types of objectives and amenities sought for preservation through these programs, but did not reveal the relative importance of these goals. Second, a comparative analysis was conducted of ranking criteria used in several state and local PDR programs.

Our goal in this part of the analysis was to discern how the priorities for preserving parcel characteristics, and weights assigned to the priorities, vary across programs. The weights can be interpreted as indirect measures of the relative importance of protecting the targeted parcel characteristics and the underlying rural amenities associated with them. In the remainder of this section, the data and approaches used in the analyses are described.

Enabling Legislation: Data and Research Approach

The enabling legislation of farmland preservation programs often contains statements relating to purpose or mission. We analyzed these mission statements for a broad set of programs related to agricultural land preservation. These programs include laws that establish agricultural districts, agricultural protection zoning, comprehensive growth management, conservation easements (such as PDRs), differential assessment, and right to farm. Using the American Farmland Trust's (AFT's) online links (AFT, 2000), or State sources for codes, the purpose and findings clauses embedded in these sets of State Codes were analyzed, and the occurrences of key phrases referring to specific rural amenities and objectives were identified. The initial step was to review the state-level laws pertaining to farmland preservation in the 48 contiguous states. This process yielded a large number of “catch phrases” relating to an underlying core set of objectives.

To synthesize this information, each phrase was categorized on the basis of an identified objective. Based on a literature review and on our reading of the enabling legislation, we developed a list of five broad categories of objectives: (a) orderly development, (b) food security, (c) local economy, (d) environmental services, and (e) protection of rural amenities. These objectives are described in table 1, panel A.

Because we are specifically interested in information about which amenities are sought for protection, the four underlying components comprising the “amenities” category are likewise considered,

⁹ A limitation of using legislation as evidence of importance of amenities is that enactment of legislation is sensitive to both the demand for rural amenities and to the supply of rural lands—i.e., in regions where farmland is abundant, there is less need for farmland protection legislation even if the population of these regions has a high demand for farming-related amenities.

¹⁰ We note this analysis is akin to imputing shadow values by examining the requirements of regulations, such as using shadow values from cost functions due to pollution regulation. As with many such exercises, there is always the issue of putting the cart before the horse—the analyst, wishing to provide information for policy makers, merely echoes back the current guesses of these self-same policy makers. However, to the extent that objectification of observed practice can illuminate, this sort of ex post analysis can be helpful.

Table 1. Legislative Language of Farmland Preservation Programs: Description of Objectives and Description of Amenities Sought for Protection

A. OBJECTIVES OF FARMLAND PRESERVATION PROGRAMS		
Objective	Description	No. of States Citing Category
Orderly Development	Orderly development of rural land, low density, physical space, lower public utility provision costs, prevention of sprawl	18
Food Security	Local and/or national food security: quantity or quality	30
Local Economy	Preserve local agricultural/timber economy, agricultural or timber jobs, other natural resource economies and jobs	24
Environmental Services	Pollution reduction, groundwater recharge, flood control, water quality/quantity, air quality	29
Protection of Rural Amenities	Protection of open space, rural/agrarian character, wildlife habitat, scenic beauty (see full description, panel B below)	36
B. AMENITIES SOUGHT FOR PROTECTION BY FARMLAND PRESERVATION PROGRAMS		
Amenity	Description	No. of States Citing Category
Open Space	Usually visual, including prevention of or slowing of development	31
Rural/Agrarian Character	Agrarian cultural heritage, historic/nostalgic/unique terrain, preserve farming/active agriculture/agricultural viability, live rural way of life/sense of community/sense of place	31
Wildlife Habitat	Includes wildlife habitat and natural areas	24
Scenic Beauty	Aesthetics: usually visual, including scenic beauty, viewing wildlife or farm activities	30

Note: Number of States' legislation reviewed = 48.

and are detailed in panel B of table 1: (a) open space, (b) rural/agrarian character, (c) wildlife habitat, and (d) scenic beauty.¹¹

Ranking Criteria: Description of Data

In the second stage of the analysis, we analyzed the ranking criteria adopted by 27 separate state and county PDR program agencies. PDR programs were included which (a) currently use point systems to objectively rank parcels; (b) were established programs with a significant history of easement purchases; and (c) were oversubscribed, so that the rankings were actually used to select or reject parcels for preservation (AFT, 2002a, b). Several PDR programs, such as the Delaware State program, are not included because they currently prioritize

parcels for preservation on the basis of least cost. Other programs, including the Massachusetts State program, Vermont State program, and the Sonoma County, California, county program identify preservation priorities but are excluded from the analysis because the criteria for prioritizing purchases is not clearly designated with a point system.

Because state and local governments in the Northeast have been the first to adopt PDR programs and tend to have the most active programs, observations from programs in this region represent about 88% of our sample. Consequently, this analysis will be most representative of the Northeast. We recognize the Northeast states may have priorities for rural land protection which are systematically different from the rest of the nation because they are the most developed, may have different settlement patterns and population demographics, and because they have the broadest and oldest set of farmland preservation programs. However, in many ways, the Northeast may be a bellwether for other rapidly growing regions.

¹¹ We evaluated the legislation by using a "yes/no" indicator if at least one of a State's farmland protection laws mentioned that particular output. We also evaluated the legislation using a weighted classification, which assigned higher scores when the legislation contained more language about a given output. The conclusions drawn were not significantly different from those reported here.

Table 2. Factors Considered in PDR Program Ranking Criteria and Descriptive Statistics

Factor for Which Points Are Awarded	Description	Mean (Std. Dev.)	Minimum	Maximum
Soil Productivity	Soil productivity or capability, percent tillable, use of land for crops and pasture	36.296 (19.207)	0	75.000
Farm Importance	Owner operated, history of family farming, important to agricultural community, farm capital improvements, specialty farm/unique production	9.519 (11.369)	0	50.000
Development Pressure	Significant nonagricultural use nearby, near/in water and sewer service areas, minimal septic limitations	12.444 (9.394)	0	40.000
Road Access/Frontage	Parcel has public road frontage	3.611 (5.565)	0	19.000
Environmental Significance	Environmental, historic, or scenic importance; water and soil conservation plans	5.685 (9.225)	0	45.000
Parcel Size/Contiguity	Parcel size, adjacent or near easements/districts/agricultural security areas/permanent open space, in agriculturally zoned area	25.630 (15.719)	0	60.000
Other	Local government support, relative best buy, special conditions	6.815 (9.684)	0	35.000

Notes: $N = 27$ PDR programs. Descriptive statistics are based on the percentage of total points allocated to the identified factor.

The ranking criteria for all the programs taken together considered 36 different characteristics, which were related to several broad factors: soil productivity, farm importance, development pressure, road access/frontage, environmental significance, parcel size and contiguity, and other considerations. Table 2 summarizes these data.¹² To facilitate comparison of the ranking systems, the descriptive statistics are reported in terms of percentage of total points allocated to the various priorities.

We investigated whether underlying factors, related to the demand and supply for farmland characteristics, help explain the observed weights given to the different priorities. Population density (*PopDen*) captures “demand” effects, while the percentage of land that is farmed (*%Farm*) and percentage of land that is prime land (*%Prime*) in the jurisdiction capture “supply” effects. The *PopDen* variable is derived from the Census of Population intercensal estimates for 1997 (U.S. Department of Commerce, Bureau of the Census, 2000), and the *%Farm* and *%Prime* variables are obtained from the Natural Resource Conservation Services’s 1997 National Resource Inventory (NRI) (U.S. Department of Agriculture). We also looked at trends in these three variables. The variables *PopDenChg*, *%FarmChg*, and *%PrimeChg* capture

the percentage change in the levels of *PopDen*, *%Farm*, and *%Prime*, respectively, between 1987 and 1997, using Census of Population and NRI data for those years. A lack of data precludes consideration of the effect on the weights in farmland protection program ranking criteria by acres preserved, or by types of land preserved, in other rural land protection programs.

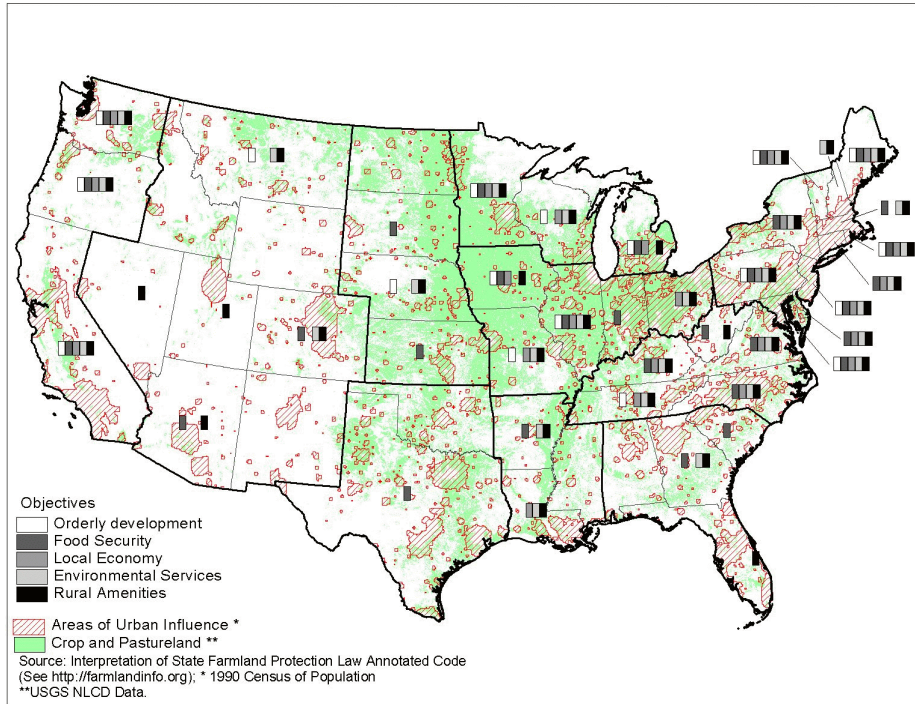
Results and Discussion

Enabling Legislation Analysis

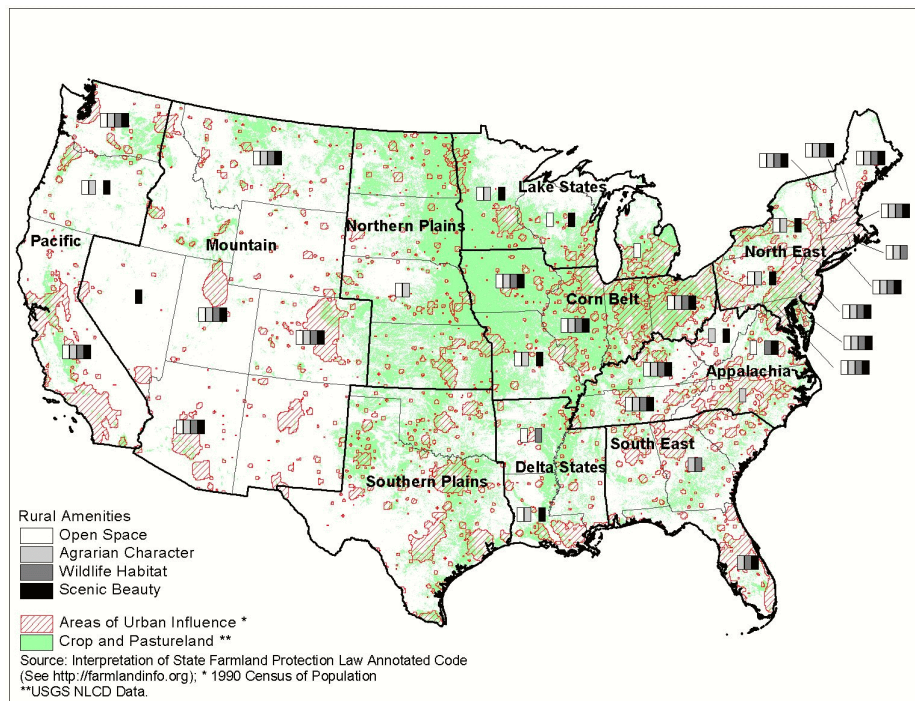
Map 1 graphically displays the states that identified each of the objectives in their farmland preservation enabling legislation. This map overlays the objectives on two base layers. The first base layer (solid shading) is the location of cropland and grassland pasture and range, from the 1990 National Land Cover Database. The second base layer (hatched areas) identifies areas of the country subject to urban influence. The extent of urban influence was determined using a gravity model and 1990 Census of Population data by block group.¹³ Although land

¹² Points assigned to use of land for specialty crops could arguably be allocated to the “soil productivity” category, rather than the “farm importance” category as we have done. Either way these points are allocated, the general conclusions discussed in this paper remain the same.

¹³ An urban influence index, essentially a measure of urban proximity, was derived for the entire United States using Census block population data and GIS-based statistical smoothing techniques. This measure is derived from a “gravity” model of urban development, and increases as nearby population increases and/or as distance from the parcel to population decreases. The index used population within a 50-mile radius of each parcel, and a linear (rather than a squared) inverse distance weighting (see Barnard, 2000, for further details.)



Map 1. Objectives of state-level farmland preservation legislation



Map 2. Rural amenities objectives of state-level farmland preservation legislation

uses and population pressures change over time, this base map at least provides a snapshot in time of the areas where agriculture may be most subject to urbanization, and provides context.

Our review of the enabling legislation of farmland protection programs suggests program objectives are non-uniform across the country. However, most of the variation appears to exist across regions rather than within regions. The Northeast, Lake, and Pacific regions place emphasis upon almost all of the objectives. With one exception, all three states in the Pacific region mention all five categories. States in these regions also tended to have enacted the broadest portfolio of farmland protection programs.

The “protection of rural amenities” is mentioned most often (by 36 states), including all of the Northeast, Lake, Appalachian, and Pacific states. Three states—Florida, Nevada, and Utah—mention protecting amenities as the sole reason for their farmland protection programs. 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.

“Orderly development” and “local economy” are goals of farmland protection laws primarily in these four regions, and are mentioned by a total of 18 and 24 states, respectively. Food security has broad appeal, and is emphasized in 30 State Codes in all regions, but is least represented in the Mountain states as a goal. The primary emphasis of these states is to protect local food supplies. Only three of these states (Michigan, California, and Oregon) also mention national food security in state legislation. Although food security is a program goal for over half of the states, it is the sole program goal for five states: Indiana, Kansas, South Dakota, South Carolina, and Texas. In heavily agricultural states with an abundance of farmland and limited development pressures, food security or open space objectives may be evidence of the influence of farmer interests, who may support farmland protection programs because they support the incomes of agricultural producers.¹⁴

Map 2 displays which states identified specific rural amenities as program protection priorities. Of states seeking to protect amenities, nearly all (except

Nevada) seek to protect more than one type of amenity. Nevada is the exception, which identified scenic beauty as important to protect through its farmland protection programs. The preservation of open space and agrarian character are sought by 31 states, with nearly as many seeking to maintain scenic beauty. Those states not mentioning these amenities as goals tend to be clustered in the Northern and Southern Plains regions. Protecting wildlife habitat does not appear to be important in the Lake, Northern Plains, and Southern Plains regions, or in almost all states in the Delta region.

Frequency counts were used to analyze the hypothesis of independence of the categories described in panels A and B of table 1, to gain insight into which objectives states attempt to achieve at the same time when enacting farmland protection programs. An exact Pearson χ^2 was used as a measure of the null hypothesis of independence (low probability values support the alternative of dependence) (Agresti, 1996). Table 3 reports these results.

In all cases where states seek to promote orderly development, protect the local economy, or protect environmental services via farmland preservation programs, those states also seek to protect rural amenities. Neither orderly development nor local economy goals appear to be significantly related to objectives for protecting wildlife habitat and natural areas, however. Concerns over protecting environmental services do appear to be significantly related to all the amenity subcategories. The results also indicate concerns about protecting local food supplies are independent of concerns for protecting rural amenities.

PDR Ranking Criteria Analysis

Although similarities exist in the types of considerations given priority, our analysis of the 27 PDR programs suggests there is substantial variation in the weights assigned by different programs to different parcel characteristics. Table 2 reveals, on average, PDR programs assign 36% of points to soils that are the most productive for agricultural uses: those having prime soils for row cropping, and those currently using the land for cropping or pasture for livestock. With the exception of one program, all PDR programs rank parcels higher the better the soil quality or the greater the amount of land in traditional agricultural uses.

The second most important priority is preserving large blocks of land, with programs assigning an average of 26% of points to this category (table 2).

¹⁴ We thank a reviewer for pointing this out.

Table 3. Independence of Amenity and Other Objectives: Results of Chi-Squared Tests

Objective	REFERENCE CATEGORY				
	Amenity Objective	Types of Amenities			
		Open Space	Agrarian Character	Wildlife Habitat	Scenic Beauty
Orderly Development	9.60 (0.0019) (+)	15.79 (0.0001)	7.43 (0.0064)	1.42 (0.2330)	5.33 (0.0209)
Food Security	2.35 (0.1251) (+)	1.96 (0.1611) (+)	1.96 (0.1611) (+)	2.17 (0.1400) (+)	0.29 (0.5937) (+)
Local Economy	16.00 (0.0001) (+)	20.49 (0.0001)	11.02 (0.0009) (+)	3.00 (0.0833)	12.80 (0.0004) (+)
Environmental Services	24.40 (0.001) (+)	26.05 (0.0001) (+)	20.13 (0.0001) (+)	10.54 (0.0012) (+)	12.82 (0.0003) (+)

Notes: The test statistic is an exact Pearson χ^2 [1], with the probability value given in parentheses. Bold values are significant at the 95% confidence interval. A plus (+) denotes that more states have both objectives than have just one or none.

Twenty-five of the 27 programs assign at least some points to preserving large blocks, and 24 of 27 programs assign at least 10% of points to this factor. The third most important priority for the average program is protecting farmland having the highest probability of being converted, but which is located in agricultural or rural areas defined by local land use plans. For the 24 programs assigning weight to this priority, the allocation of points ranges from 2% to 40%. Less than 10% of points are assigned to categories of priorities that protect family and owner-operated farms, farmland along roads and highways, and farmland with particular environmental, historic, or scenic significance.

The emphasis on preserving productive soils and row cropping and pasture uses suggests preferences for preserving cropland and livestock operations. These types of operations meet several objectives and provide a variety of amenities, as identified in table 1. However, these specific uses of land are necessary conditions for two objectives in particular: providing local food security, and agrarian character. It is possible this emphasis is indicative of the public's underlying preferences for specific rural amenities generated by these types of operations. But it is also possible that program administrators seek to first preserve those lands most likely to be utilized by full-time (as opposed to recreational) farming operations—a strategy likely to be supported by commercial farm interests. Alternatively, perhaps these operations are expected to be profitable to farm for the foreseeable future. Thus,

program administrators may justify this strategy because they believe it increases the likelihood that any rural amenities associated with farmland will be provided in the longer run.

A potential drawback of favoring croplands is that, relative to other rural land uses such as woodland operations, cropland may exacerbate environmental problems due to increased runoff from fertilizers and topsoil. This priority on croplands might therefore be interpreted as simultaneously expressing limited preferences for environmental service-related amenities. However, based on our review, many programs tend to require farmers to adopt water quality and soil conservation plans as a *condition* for easement sale, rather than including such environmental service preferences in the ranking criteria. Thus, even though the programs assign minimal points to environmental criteria in their ranking schemes, the design of PDR programs is generally not inconsistent with protecting “environmental quality” amenities.

The priority given to farmland facing development pressure suggests rural lands closer to population concentrations are preferred. The priority given to the preservation of larger farms and blocks of farms indicates a preference for preserving parcels in clusters. This spatial arrangement of preserved lands could arguably contribute to a number of objectives and amenity preferences: orderly development, open space, wildlife habitat, and scenic beauty. Also, fewer borders with nonfarm neighbors may minimize nuisance complaints arising

Table 4. Correlations Between PDR Ranking Weights and Explanatory Variables

Factor	Variables					
	<i>PopDen</i>	<i>%Prime</i>	<i>%Farm</i>	<i>PopDenChg</i>	<i>%PrimeChg</i>	<i>%FarmChg</i>
Soil Productivity	! 0.01945 (0.9233)	0.09822 (0.6331)	0.08305 (0.6805)	0.17677 (0.3778)	! 0.00852 (0.9671)	! 0.04384 (0.8281)
Farm Importance	! 0.13479 (0.5027)	! 0.32251 (0.1081)	! 0.07748 (0.7009)	! 0.00381 (0.9850)	0.16866 (0.4102)	0.08670 (0.6672)
Development Pressure	0.04704 (0.8158)	0.05875 (0.7756)	! 0.17337 (0.3871)	0.04144 (0.8374)	! 0.02644 (0.8980)	0.15074 (0.4530)
Road Access/Frontage	0.53381 (0.0041)	! 0.26702 (0.1873)	! 0.46785 (0.0139)	0.29806 (0.1310)	! 0.48263 (0.0125)	! 0.42815 (0.0223)
Environmental Significance	! 0.03384 (0.8669)	! 0.26383 (0.1928)	! 0.08176 (0.6852)	! 0.15364 (0.4442)	0.15750 (0.4422)	0.09338 (0.6432)
Parcel Size/Contiguity	! 0.19951 (0.3184)	0.37637 (0.0581)	0.37634 (0.0530)	! 0.16779 (0.4028)	0.10404 (0.6130)	0.07898 (0.6954)

Notes: Bold values are significant at the 10% one-sided confidence interval. Numbers in parentheses are probability values.

from normal farming activities (e.g., the odor of recently spread manure), and may help protect the local farming economy by encouraging more farmers to participate and sell development rights.

Given the small size of the data set, correlation coefficients are used to investigate relationships. Table 4 reports the correlations between the “weights” and the underlying factors. Overall, the correlations do not reveal any striking relationships. However, using a nonstringent standard (10% one-sided confidence interval), a few relationships can be observed between the variables and the weights assigned to farm importance, road access/frontage, and parcel size/contiguity.

The weight assigned to road access appears to be related to several explanatory variables. Population density, both its starting level and a positive change over time, are correlated with higher weights assigned to the road access factor. Larger (negative) changes in prime land and farmland in general are also correlated with higher road access weights. In addition, where high levels of existing farmland occur, the weight given to road access is lower. From our reading of the ranking criteria, most PDR programs incorporating road frontage or access as a factor do so because of a desire to provide scenic views. The correlations tentatively suggest that the importance of road frontage (and providing scenic views) through PDR programs increases when little farmland remains, and when losses in prime land—and farmland—are limiting the ability to provide this amenity. Also, our analysis indicates smaller percentages of prime farmland may be related to higher priorities given to “farm importance” factors, which contribute to providing “agrarian heritage” amenities.

Higher weights assigned to preserving larger farms or blocks of farms are correlated with higher levels of prime land and farmland (*%Prime* and *%Farm*) in the jurisdiction (table 4). As suggested previously, priority given to this criterion could arguably be indicative of desires to promote orderly development, and to protect the local economy, open space, wildlife habitat, and scenic beauty. It could also be indicative of efforts to prioritize criteria most favorable to farmers, who are likely to prefer farming to nonfarm neighbors.

For a somewhat more detailed examination, chi-squared tables were constructed for interactions between the explanatory factors and the weights. Each variable was recoded into an ordinal measure, based on quartiles of the range of this variable. Thus, chi-squares are computed against a 4 × 4 table (although for some variables yielding an abundance of zero values, only three levels are used).¹⁵ As with the correlations, most of the chi-squared statistics were not significant, but those that were found to be significant enable us to make a few observations. First, higher levels of change in the percentage of prime farmland are associated with greater weight given to the soil productivity criterion. Although significant, there is no obvious pattern linking soil productivity and change in percentage of prime land, or to change in population density. Consistent with the correlations, larger (negative) changes in the percentage of prime land and increases in population density in a jurisdiction are related to a greater weight given to road frontage. The analysis

¹⁵ The chi-squared tables are available from the authors upon request.

also suggests the largest (negative) changes in the percentage of prime farmland are somewhat associated with less weight to environmental attributes—which may imply other concerns take precedence in periods of significant farmland losses.

Summary

We have reviewed an extensive set of legislation enabling a plethora of farmland preservation programs, and the selection criteria employed in 27 Purchase of Development Rights (PDR) programs that utilize point-based ranking systems. The empirical information examined in this analysis lacked sufficient power (in terms of number of observations and variation) to permit definitive conclusions on the values of different rural amenities. Nevertheless, insights can be offered on how farmland preservation programs operate as a policy instrument for protecting rural amenities. Some of these insights identify the kinds of rural amenities that seem to be most important, while others highlight issues relating to the design and implementation of farmland protection policies.

A content analysis of enabling legislation revealed that state and local governments use farmland preservation programs to accomplish multiple objectives and to protect a large number of rural amenities. “Protection of rural amenities” was the most frequently occurring objective, cited in legislation of 36 states. Those amenities most often sought for protection through these programs are maintaining an agrarian heritage, open space, and scenic beauty. These specific types of amenities were cited as objectives at least as often as local food security and environmental services (objectives in 30 and 29 state programs, respectively).

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. Simple statistics used to analyze PDR programs—those programs that employ point-based systems for selecting land parcels for preservation—reveal that this subset of programs appears to favor protecting high-quality soils and actively farmed agricultural lands rather than passive open space uses. Although these particular types of lands can provide a variety of amenities, they are necessary conditions for the provision of rural amenities associated with agriculture, such as local food security and agrarian heritage. Other studies have found the public in some areas may be interested in preserving

a broader mix of farmlands, one that includes orchards and other unique land types (e.g., Kline and Wichelns, 1998), or less productive lands better able to provide amenities which are not dependent on active agriculture (such as “open space” and “wildlife habitat”). Rather than signaling that existing PDR programs are misdirected, the priority given to the best soils and active farm operations could represent a program feature designed to garner the support of commercial farm interests.

Alternatively, by selecting the best agricultural lands, the probability the land will end up being idle, and therefore not provide “rural amenities associated with agriculture,” is diminished. This prioritization 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 could imply program managers make a tradeoff between the long-term provision of amenities (from farms deemed most likely to survive) against the optimal set of “rural amenities associated with agriculture” (which could be obtained if farm survival was not an issue) the public desires today.

Use of correlation coefficients reveals that PDR programs favoring selecting parcels with road frontage—which could be indicative of a desire to protect scenic views—were significantly correlated with jurisdictions that are losing higher percentages of a limited farmland base. Additionally, our findings show PDR programs tend to assign little priority to protecting environmental services in their parcel selection criteria; the lack of priority also was not correlated with factors relating to development pressures or farmland losses. However, our review of these programs found they often require the adoption of water quality and soil conservation practices as a condition for eligibility to sell development rights—implying that protection of at least some environmental services is given the highest priority. Also, one could argue that PDR programs prioritize the protection of these and other environmental services simply by removing the potential for the land to be converted to a more intensive use (i.e., development) which is likely to be more environmentally detrimental. An example is the protection of groundwater recharge areas provided by farmland enrolled in PDR programs, a protection not provided by land in developed uses.

PDR rankings also suggest preferences over the spatial distribution of preserved lands and the rural amenities they provide—favoring those amenities which are facing development pressure and which

are best produced by larger blocks of farmland (e.g., expansive scenic views within driving distance of cities). Preferences for larger blocks appear to be correlated with areas having a higher base of existing farmland and prime land; however, we did not find a correlation between the priority given for farms facing development pressure and a jurisdiction's population density, its farmland base, or changes in these measures.

Not all PDR programs use point systems to prioritize the purchase of easements on agricultural lands. Most of those employing other systems tend to consider the same factors explored in our correlation analyses, but use more subjective ranking systems. Still other programs consider different factors altogether. For example, some other PDR programs that do not use point systems were found to intentionally distribute preservation funds across the jurisdiction. One reason for this practice could be to create a broad base of support for program continuation.

In other programs, 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. These strategies can result in significantly different outcomes from point-based systems—such as a more scattered pattern of preserved farms, or the preservation of lands distant from urban centers.

The approach utilized here provides a broader and different perspective in exploring the relationship between farmland protection programs and rural amenities, relative to studies in the literature using survey data from a limited geographic area to assess public preferences over goals or willingness to pay to protect farmland. Our findings reveal farmland preservation programs may protect a wide variety of amenities. However, based on our analysis of PDR programs, variation in the relative weights associated with various amenities (more precisely, the weights associated with protecting parcel characteristics related to various amenities) is not easily explained by factors that are likely to characterize areas with farmland losses.

References

- Agresti, A. (1996). *An Introduction to Categorical Data Analysis*. New York: John Wiley and Sons, Inc.
- American Farmland Trust (AFT). (2000). "State Farmland Protection Statutes by State." Online. Available at <http://www.farmlandinfo.org/fic/laws.html>.
- . (2002a, January). "Status of State PACE Programs." Fact sheet. Online. Available at <http://www.farmlandinfo.org>.
- . (2002b, January). "Status of Local PACE Programs." Fact sheet. Online. Available at <http://www.farmlandinfo.org>.
- Barnard, C. H. (2000). "Urbanization Affects a Large Share of Farmland." *Rural Conditions and Trends* 10(2), 57–63.
- Beasley, S. D., W. G. Workman, and N. A. Williams. (1986). "Estimating Amenity Values for Urban Fringe Farmland: A Contingent Valuation Approach: Note." *Growth and Change* 17, 70–78.
- Bergstrom, J., B. Dillman, and J. Stoll. (1985). "Public Environmental Amenity Benefits of Private Land: The Case of Prime Agricultural Land." *Southern Journal of Agricultural Economics* 17(1), 139–149.
- Bowker, J. M., and D. D. Didychuk. (1994, October). "Estimation of Nonmarket Benefits of Agricultural Land Retention in Eastern Canada." *Agricultural and Resource Economics Review* 23(2), 218–225.
- Cattaneo, A., S. Bucholtz, J. Dewbre, and C. Nickerson. (2002, July). "The CRP Balancing Act: Trading Off Costs and Multiple Environmental Benefits." Paper presented at annual meetings of the American Agricultural Economics Association, Long Beach, CA.
- Cropper, M., W. Evans, S. Berardi, M. Dulca-Soares, and P. Portney. (1992). "The Determinants of Pesticide Regulation: A Statistical Analysis of EPA Decision Making." *Journal of Political Economy* 100(11), 173–197.
- Duke, J. M., and R. A. Hyde. (2002). "Identifying Public Preferences for Land Preservation Using the Analytic Hierarchy Process." *Ecological Economics* 42(2), 131–145.
- Furuset, O. (1987). "Public Attitudes Toward Local Farmland Protection Programs." *Growth and Change* 18(3), 49–61.
- Halstead, J. (1984). "Measuring the Nonmarket Demand Value of Massachusetts Agricultural Land: A Case Study." *Journal of the Northeastern Agricultural Economics Council* 13(1), 12–19.
- Heimlich, R. E., and W. D. Anderson. (2001). "Development at the Urban Fringe and Beyond: Impacts on Agriculture and Rural Land." Ag Econ Report No. 803, USDA/Economic Research Service, Washington, DC.
- Hellerstein, D., C. Nickerson, J. Cooper, P. Feather, D. Gadsby, D. Mullarkey, A. Tegene, and C. Barnard. (2002). "Farmland Protection: The Role of Public Preference for Rural Amenities." Ag Econ Report No. 815, USDA/Economic Research Service, Washington, DC.
- Hewitt, J., and D. Brown. (2000). "Agency Costs in Environmental Not-for-Profits." *Public Choice* 103, 163–183.
- Irwin, E. G., and N. E. Bockstael. (2001). "The Problem of Identifying Land Use Spillovers: Measuring the Effects of Open Space on Residential Property Values." *American Journal of Agricultural Economics* 83(3), 698–704.
- Kline, J., and D. Wichelns. (1996). "Public Preferences Regarding the Goals of Farmland Preservation Programs." *Land Economics* 72(4), 538–549.
- . (1998). "Measuring Heterogeneous Preferences for Preserving Farmland and Open Space." *Ecological Economics* 26(2), 211–224.
- Krieger, D. J. (1999, April). "Saving Open Spaces: Public Support for Farmland Protection." Working Paper Series WP99-1. Center for Agriculture in the Environment, Chicago, IL.

- Margolis, H. (1992). *Selfishness, Altruism, and Rationality*. Cambridge, MA: Cambridge University Press.
- Migue, J. L., and G. Belanger. (1974). "Towards a General Theory of Managerial Discretion." *Public Choice* 17, 27–47.
- Nickerson, C. (2001, April). "Smart Growth: Implications for Agriculture in Urban Fringe Areas." *Agricultural Outlook*, pp. 25–28.
- Niskanen, W. A. (1991). "A Reflection on Bureaucracy and Representative Government." In A. Blair and S. Dion (eds.), *The Budget-Maximizing Bureaucrat: Appraisals and Evidence*. Pittsburgh, PA: University of Pittsburgh Press.
- Quiggin, J. (1997, June). "Altruism and Benefit-Cost Analysis." *Australian Economic Papers* 36(68), 144–155.
- Reichelderfer, K., and R. A. Kramer. (1993). "Agricultural Resource Policy." In G. Carlson, D. Zilberman, and J. Miranowski (eds.), *Agricultural and Resource Economics*. New York: Oxford University Press.
- Rosenberger, R. (1998). "Public Preferences Regarding the Goals of Farmland Preservation Programs: Comment." *Land Economics* 74(4), 557–565.
- Rosenberger, R., and R. Walsh. (1997). "Nonmarket Value of Western Valley Ranchland Using Contingent Valuation." *Journal of Agricultural and Resource Economics* 22(2), 296–309.
- Samuelson, P. (1954). "The Pure Theory of Public Expenditure." *Review of Economics and Statistics* 36(4), 381–389.
- Stevens, J. (1993). *The Economics of Public Choice*. Boulder, CO: Westview Press.
- U.S. Department of Agriculture, Natural Resource Conservation Service. (1997). *National Resource Inventory (NRI)*. USDA/NRCS, Washington, DC.
- U.S. Department of Commerce, Bureau of the Census. (2000). "Intercensal Estimates by County." Online. Available at <http://eire.census.gov/popest/data/counties/tables/CO-EST2001-12.php>. [Website revision date May 23, 2002].
- Weingast, B., and M. Moran. (1983). "Bureaucratic Discretion or Congressional Control? Regulatory Policymaking by the Federal Trade Commission." *Journal of Political Economy* 91, 765–800.
- Yates, A., and R. Stroup. (2000). "Media Coverage and EPA Pesticide Decisions." *Public Choice* 102, 297–312.