# RURAL AMENITIES

# and

# FARMLAND VALUES

By

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## Introduction

Farmland value reflects the economic returns from the various products and services available from that land. Buyers and sellers agree on a price that captures expected income from the relevant outputs. Among the farmland services are certain amenities, some of which the landowner may withhold from non-payers and others for which exclusion costs are very high.

This paper considers the economic importance of both categories of amenity services of actively farmed land -- those that are private goods, captured by the owner and priced for sale to consumers, and public goods that are non-exclusive and/or non-rival in consumption and whose values are not reflected in market price. Included in the former category are hunting rights, on-farm recreation, farmers markets and certain landscape features that may make one parcel of land more valuable than another. In the latter category are such eco-system services as groundwater recharge, nutrient cycling, reduced flood risk and the overall cultural or Aheritage value@ of farms in a rural setting. Both categories of land service are important and will affect land use patterns, but only private goods are directly exchanged in a market. Public good services of privately

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owned land are secured through policy.

While the landowner has the right to determine the mix of products and services flowing from a particular parcel, these output choices are made within an opportunity set shaped by various laws and institutions that establish relationships among people in a modern society. Those who do not own farmland but value certain eco-system or other amenity services will express those preferences through the policy process. Policy changes will alter the opportunity sets of farmland owners. Examples of such policy changes are the Endangered Species Act of 1974 that requires the farmer to avoid actions that could destroy habitat, the Environmental Quality Incentives Program in the 1996 Farm Bill that pays farmers to avoid actions that may pollute the waterways, and agricultural conservation easement programs that purchase the owner's right to develop the land. Each of these institutions affects land use by adjusting the choice sets of owners.

Policies, rules and incentives that influence the land use options available to the owner can be expected to be reflected in land price. If a farmer sells his development rights, the market price of that land will generally decline accordingly. If agricultural zoning limits the list of acceptable uses of farmland, its market price will generally decline. In some situations, however, the price effects of these policies may be modest or non-existent if expectations are such that the policies will not be enforced on a permanent basis. In other situations, development restrictions in an area may make the land more attractive to a buyer primarily looking for amenity value. The latter part of this paper examines the evidence of the impact of amenity-securing institutions on the market value of farmland. The paper concludes with some general observations regarding the efficacy of these programs based on the empirical evidence that exists in the literature.

**Conceptual Framework**

In the simplest model of land valuation, land is treated solely as a productive asset used to produce marketable goods and services (Randall and Castle, 1985). Because land is a fixed factor of production, land rents, *R(t)*, are generated by any economic surplus associated with the production of market goods: $R(t) = (p_z*Z(t) - p_x*X(t))/L$, where $Z$ is a vector of market goods, $X$ is a vector of inputs (excluding land), $L$ is land, and $p_z$ and $p_x$ are the output and input price vectors respectively. Rents are capitalized into the value of the land, so that the price of land is determined by the present discounted value of rents over an infinitely long time horizon associated with the land parcel:

$$V_0 = \int_0^{\infty} e^{-rt} R(t) dt \,. \tag{1}$$

Following Ricardo's basic insight, rents from the land are determined by differences in land quality and positive rents accrue to scarce, high quality land. Land quality is broadly defined as parcel-level characteristics that determine the productive capacity of the land parcel to generate marketable goods and services. The most obvious of these when land is in agricultural use is soil fertility, but other land characteristics may matter as well if other land uses are possible. If the parcel is in an urbanizing area, land characteristics that influence the potential returns or costs of development will generate rents, e.g. impervious soil and steep slopes will add to the costs of development so that positive rents will accrue to level parcels with soils that permit effective drainage. In addition, rents will accrue to land based on its relative location. As von Thunen first demonstrated, land located close to a central market will generate positive rents due to savings in transportation costs. Other location characteristics may matter as well, e.g. externalities from

neighboring land uses and access to highways. Denoting on-site characteristics as $H(t)$ and location characteristics as $D(t)$, the determination of rents can be generally specified as $R(t) = R(Z(t),G(t),p_z,p_x)$ where $Z(t) = Z(H(t),D(t),X(t),L)$ and $G(t)$ includes regional factors that may influence rents, including regional population, preferences, and government policies.

Because rents accrue according to the actual and potential land uses of a parcel, $R(t)$ can be decomposed into actual and potential rents that accrue to the land in its existing and alternative land uses. For simplicity, assume that land can be either in an agricultural use, where $R_A(t)$ represents the rents accruing to land from its use in agriculture, or an urban use, where rents accruing to land in an urban use are denoted $R_U(t)$. In rural areas located far away from urban activities, land rents will be determined primarily by $R_A(t)$ whereas in urbanizing areas, it is likely that $R_A(t)$ will be relatively small compared to $R_U(t)$. The primary characteristics influencing $R_A(t)$ are soil fertility and other physical features of the land that determine agricultural productivity. However, to the extent that secondary goods and services can be produced with the land in an agricultural use, other features of the land may matter as well. For example, the opportunity to rent land out for hunting may increase the rents from pasture or wooded areas. Locations nearer to urban areas may increase the returns from agricultural land, e.g. proximity to urban populations increases the potential rents from agri-tourism activities on the land.2 Using the subscript $A$ to denote variables that generate $R_A(t)$ and the subscript $U$ to denote variables that generate $R_U(t)$, we can further specify $R(t)$ as:

$$R(t) = \sum_k R_k(Z_k(t),G_k(t), p_{zk},p_{xk}) \qquad (2)$$

where $Z_k(t) = Z_k(H_k(t),D_k(t),X_k(t),L)$ and $k = A,U$. In facing a decision regarding the optimal use

of land, a private landowner will consider the expected rents from the land over time and choose the optimal land use or optimal sequence of land uses that maximizes this discounted stream of returns over time.

So far we have ignored externalities and public goods associated with land that may generate a range of external benefits and costs. For example, as is discussed in more detail below, agricultural land generates nonmarket benefits, including open space amenities that provide scenic views and reduce the overall level of development and congestion in an area. While these benefits do not accrue to the private landowner, they do generate benefits for others and therefore influence the socially optimal allocation of land across different uses. For this reason, it is important to consider these additional sources of value and the extent to which they augment (or diminish, in the case of external costs and public bads) the rents that accrue to private landowners in a particular land use. Because we are concerned primarily with rural amenities and farmland values in this paper, we focus on the social benefits that are associated with farmland.

The social benefits associated with farmland can be categorized as distance-based benefits that are essentially local and decay with increasing distance from the farmland and distance-independent benefits that accrue to the community or region as a whole. The former are largely externalities, such as open space amenities, that provide the greatest benefit to those who are immediately adjacent to the parcel and whose benefits lessen as distance from the farmland increases. Because they are somewhat excludable, in the sense that not everyone can locate immediately adjacent to the farmland, these benefits are a form of an impure public good. The latter, on the other hand, are benefits that are independent of distance from the farmland and

2 We discuss these and other market-based amenity services of farmland in the following section.

accrue to equally to members of the community or perhaps region and therefore more closely resemble a pure public good. Examples include provision of wildlife habitat areas and groundwater recharge.

These social benefits can be incorporated into the asset-based definition of rents in (2) to define the social returns of farmland, $R_A^S(t)$, which includes both private rents from productive activities that accrue to the landowner and social benefits from the land being in an agricultural use that accrue to society:

$$R_A^S(t) = R^S{}_A(Z_A(t), G_A(t), E_A(t), p_{zA}, p_{xA}) \quad (2)$$

where $E_A(t)$ is a vector of distance-decaying externalities and distance-independent public goods that generate the social benefits from farmland. As discussed below, depending on the type of social benefit, revealed preference methods may or may not be able to identify the contribution of $E_A(t)$ to $R_A^S(t)$. For example, hedonic methods are commonly used to estimate the distance-based externalities associated with farmland, most notably its value as an open space amenity. However, stated preference methods are necessary for identifying nonuse values, including option and existence values, associated with the social benefits of farmland, e.g. the value of preserving wildlife habitat.

**Amenities as Private Goods**

Some farmers in urbanizing areas have learned that the most valuable outputs of their land may be the amenity services. Customers will pay for the privilege of picking their own corn or apples. They will pay for the right to hunt deer or other game. They will choose the farm setting as a tourism destination, if the owner provides those opportunities.

Farmers Markets and Consumer Supported Agriculture. People will pay for the opportunity to buy Afarm fresh produce@ direct from the farmer. The owner is thus selling the consumer an additional farmland service, direct personal contact with the production site or process. There were fewer than 100 farmers markets in 1980. The Agricultural Marketing Service of USDA began keeping track of the numbers in 1994, and by 2000 number of farmers markets had increased to nearly 3000, providing the sole marketing outlet for about 19,000 farmers throughout the US (CAST, 2002). Consumers know that they are paying more for the produce than they would in a supermarket, but feel that the sweet corn, blueberries, garden vegetables and other products are somehow Afresher@ and better flavored. In one study, 80% of consumers shopping at farmers markets indicated willingness to pay a premium over supermarket prices, 44% expressed the desire to support local farmers as another reason for paying higher prices at the farmers market and 30% of respondents referred to the Abuying experience@ as one service they were acquiring from farmers (Lev and Stephenson). Consumers using farmers markets will also buy other products -- jams, baked goods, baskets and other crafts -- that they associate with the farm, whether or not the farm family actually prepared the product. Urban residents view the trip to the farmers market as recreation, an alternative to a day at the library, shopping mall or other venue. Participants in the WIC and food stamp programs of USDA may spend their coupons at farmers markets, totaling over $100 million a year. Farmers markets typically support food bank and gleaning programs running in various states.

Consumer supported agriculture (CSA) is a means by which consumers may purchase a share of produce from a farm and share in the risk of production variability at the same time. The farm becomes theirs at some level and they may work on the farm to improve chances for a good

crop. The share ownership and chance to work in the fields for their own output are services that consumers purchase from the farmer (see Henderson and Van En, 1999).

Most CSA=s employ organic or other ecologically friendly production systems. Consumers who insist on organically grown produce are buying a sense of personal security from the farmer. They exhibit a certain willingness to pay for the marginal increment of security from produce raised without pesticides. Organic certification and labeling enable the farmer to deliver a specific service for a price. Stahlbush Island Farms in western Oregon, for example, will establish a contract with consumers assuring them that produce from that farm is grown with Agreen@ technologies, including organic methods in some cases (CAST, 2002). The buyer is paying for produce, personal security and a farming system that is ecologically sound. These are farmland services, bought and paid for, part of the income flow to that farm that is capitalized in land value.

The Value of Agri-tainment. People will pay for the opportunity to visit a farm and experience a little of the farming life. Visitors to Ohio's predominately Amish counties will pay for the chance to stay at a farm, help with farm chores, enjoy family style Amish meals and generally experience the Amish farm life that feels like traditional farming before the advent of huge combines and inorganic fertilizers. The farm is an alternative to other forms of weekend recreation and the purchased services have little if anything to do with the farm crop itself.

Graf Growers, located inside the city limits of Akron, Ohio, is an example of farms that sell all sorts of recreation and educational experiences focused on the farm operation. There are seminars on flower arranging, bee keeping, tree grafting, and care of bulbs. There are special farm events for busloads of local school children, hayrides, corn roasts and other special events. The

farm specializes in sweet corn and apples. The Graf Grower label on these products assures their quality and commands a price increment. Craig Graf knows that his competition is not other farms but parks and other recreation sites. Graf Growers is an intensive use of farmland, generating income from a variety of services connected to the farm, competing favorably with development that is not tied to farm production.

Vermont dairy farmers will alter the milking schedule to permit visitors Ato join Bob for the floorshow with the girls down in the barn@ (Russell, 1997). The Economic Development Office in Loudon County, Virginia arranges self-directed tours of Virginia fruit farms and vineyards, Fall color tours with stops at selected farms. The right to hunt on farmland is valued by many, some as individuals and others in large hunting clubs. Farmers may grant permission to hunt on their land for a price. One Illinois farmer earns $600 a day for access to prime deer habitat along the Mississippi River. A Kansas Aringneck ranch@ attracts more than 800 bird hunters a year (Miller, 1999).

These are separable, rival-in-consumption farmland amenity services that are priced and part of farm income flow, capitalized in land value. They become parts of adaptive strategies for farmers at the rural-urban fringe and represent additional income sources that maintain farm viability in times of low product prices.

Composting and Other Eco-system Services. Some farms can market the nutrient cycling capacity of land. Farmers in several states contract with the nearby municipalities to receive wastewater for secondary treatment as irrigation water. Farmland is the essential component of wastewater treatment for hundreds of communities and subdivision developments that employ Apackage systems.@ Price-Barnes Organics in central Ohio composts lawn waste from near-by

communities, converts recycled newsprint into litter for the hog operation, uses certain food processing by-products as an energy supplement for dairy heifers and in other ways employs the nutrient cycling capacity of farmland to earn income and good will among non-farm neighbors. The composted mixture of farm animal manure and community-generated lawn and garden waste is then packaged and sold to nurseries and garden stores.

**Amenities as Public Good Services of Farmland**

In addition to this range of private amenity-based goods, farmland generates a variety of externalities and public goods. Because of the nature of these goods and services, the benefits are not capitalized into the private returns from the farmland and therefore drive a wedge between the private and social optimal amount and distribution of farmland within a region. If the net external benefits of farmland are positive, this implies that $R_A^S(t) > R_A(t)$ and therefore that farmland will be underprovided in the absence of policies that attempt to correct this market failure. Quantifying the magnitude and nature of these external benefits is important for designing policies aimed at providing the socially optimal amount of farmland.

As discussed above, the social benefits associated with farmland may be distance-based benefits that are essentially local and decay with increasing distance from the farmland or distance-independent benefits that accrue to the community or region as a whole. The former are largely open space amenities that provide the greatest external benefit to those who are immediately adjacent to the parcel. Because they are excludable, in the sense that not everyone can locate immediately adjacent to the farmland, these benefits are capitalized into the property values of neighboring land parcels and therefore it is possible to use revealed preference

techniques (namely hedonics) to estimate the direction and magnitude of these distance-based amenities. On the other hand, any nonuse benefits that are associated with farmland, including those that are independent of distance and that accrue more or less equally to members of the community (e.g. existence value of farmland), can only be elicited via stated preference methods, namely contingent valuation or contingent choice (or conjoint) analysis. In what follows, we briefly review each of these methodologies and the empirical evidence with respect to the non-market amenity values of farmland.

Hedonic Pricing Method. The hedonic pricing method is a revealed preference technique that relies on the fact that the spatial immobility of land results in the capitalization of location amenities, such as open space spillovers from nearby farmland, into the sales price of residential homes. Therefore surrounding land uses create amenity (and disamenity) effects that are included in the bundle of characteristics that describe a residential location and that are traded-off with other features when households make residential location choices. Hedonic pricing models offer a means to estimate the marginal implicit prices of characteristics associated with a differentiated market good such as housing based on the interactions of many buyers and sellers in the market. The hedonic pricing function posits price as a function of the quantities of a good's attributes. The marginal implicit price of any of the attributes is found by differentiating the hedonic price function with respect to that attribute, which, when evaluated at an individual's optimal choice, represents the individual's marginal willingness-to-pay for the attribute. As such, it provides a means for uncovering the marginal value associated with distance-dependent externalities that are generated by nearby farmland.

Using some of the notation introduced earlier, the hedonic residential pricing model can be

specified as: $P_i = P(H_i, D_i, F_i, Q_i; \beta, \lambda, \delta, \theta)$, where $P_i$ is the residential sales price of the $i^{th}$ property, $H_i$ is a vector of on-site characteristics associated with the land, $D_i$ is a vector of locational variables, $F_i$ is a scalar that measures the proportion of farmland within a local neighborhood of parcel $i$, $Q_i$ is a vector of structural attributes associated with the house, and $\beta$, $\lambda$, $\delta$, and $\theta$ are the respective parameter vectors to be estimated.

Several econometric issues arise in estimating hedonic models, including functional form, extent of the housing market, multicollinearity, and spatial error autocorrelation. As discussed by Irwin (2002) and Irwin and Bockstael (2001), an issue that is specific to the estimation of open space externalities using hedonic pricing models is the identification of these effects given the potential endogeneity and spatial error autocorrelation of the neighborhood open space variables. These problems arise if the neighboring open space, such as farmland, can be converted to a residential use at any point in the future, implying that it is then part of the regional market for residential land and thus subject to the same economic forces that determine a location's residential value. Such a situation would imply that variables measuring the influence of this "developable" open space on neighboring residential property values will be endogenous in a hedonic pricing model and, as a result, identification problems arise that bias the open space coefficients. The problem is further complicated by the presence of spatial error autocorrelation, which is likely to be correlated with the endogenous measures of open space and therefore introduces a second source of bias in the estimation. While the issues of functional form, extent of the market, and multicollinearity are well recognized in the hedonic literature, the empirical challenges that arise from spatial error autocorrelation and the potential endogeneity of neighboring open space land have not been addressed by most empirical studies. Finally, Riddel

(2001) notes that the amenity value of proximity to open space may accrue over time due to housing market inefficiencies that lead to time lags in the full capitalization of environmental amenities into housing prices. In this case, cross-sectional data may be insufficient for revealing the true marginal value of a neighboring environmental amenity.

Several studies have employed the hedonic pricing method to estimate the marginal contribution of neighboring farmland to residential property values.[3] These studies use the estimates from the first stage estimation are used to calculate the implicit price associated with an acre of neighboring farmland. For example, Ready, Berger, and Blomquist (1997) use a hedonic pricing model of housing expenditures and hourly wages to estimate the amenity effects associated with proximity to horse farms using county-level data from a national sample of households living within metropolitan areas. They use the results to estimate the average marginal willingness-to-pay of Kentucky residents to prevent the loss of one horse farm, which they calculate to be an annual payment of $0.43. Johnston et al. (2001) use data on market transactions of houses from Suffolk County, NY to estimate a hedonic pricing model of residential property values in which proximity to farmland is included as a location characteristic. Contrary to expectations, they find that residential property values are negatively influenced by proximity to farmland. Specifically, the results indicate that a parcel that is adjacent to farmland has, on average, a 13.3% lower per acre value than a similar parcel that is not adjacent to farmland. However, because problems of spatial autocorrelation and potential endogeneity issues

3 The following summary is focused on studies that have isolated the effects of farmland vs. other types of open space on residential property values. Papers that have used the hedonic pricing method to study the externality effects of other types of neighboring open space or just open space in general include Cheshire and Sheppard (1995) (private vs. public open space), Garrod and Willis (1992) (woodlands), Geoghegan (2002) (permanent vs. "developable" open space), Geoghegan, Wainger, and Bockstael (1997) (open space), Mansfield, et al. (2002) (urban forests), Riddel (2001) (open space), and Tyrävinen and Miettinen (2000) (forests).

associated with neighboring farmland are not addressed, these results may not reflect the true marginal effects of neighboring farmland. Irwin (2002) uses a hedonic pricing model of residential property values to estimate the influence of surrounding cropland, pastureland, and preserved agricultural land on the residential values of neighboring homes in a central Maryland region. Problems of endogeneity of surrounding open space measures and spatial error autocorrelation are dealt with by using an instrumental variables approach and a spatial sampling routine that omits nearest neighbor properties. Results show that conversion of one acre of either surrounding cropland or pastureland to low-density residential development decreases the value of the mean residential property by $1,530, whereas conversion to a commercial or industrial use reduces the mean residential property value by $4,450. These estimates can be interpreted as an individual's marginal willingness to pay to avoid the loss of an additional acre of either surrounding cropland or pastureland and demonstrate that this value depends on the alternative land use state. Results also indicate a premium associated with protected agricultural land. If an acre of surrounding land is preserved as a permanent agricultural easement, then the value of a neighboring residential property is estimated to increase by $4,523. Extending this result to a hypothetical 10-acre parcel of farmland that is located in the center of a low-density residential development, the predicted benefits of preserving the land as an agricultural easement are found to range from $10,403 to $52,014 per acre of preserved open space, depending on the density of the neighboring residential development. These estimates can be interpreted as the total marginal willingness-to-pay of residents located within a sufficiently close neighborhood of the preserved farmland to benefit from its amenity effects.

Stated Preference Methods. In contrast to the hedonic pricing method, which relies on

indirect methods and observed behavior to estimate the value of nonmarket goods or services, stated preference methods rely on stated responses regarding individuals' anticipated behavior in a hypothetical market situation. Two primary methods have been used in this regard to identify the nonmarket value of farmland: contingent valuation and conjoint analysis.

The contingent valuation method (CVM) relies on the consumer's direct evaluation of how a marginal change in the good or service of interest will influence his/her utility level in terms of the amount that the consumer would be willing to pay in order to obtain (or retain) a higher level of the good or service in question. This approach is dependent on the consumer having detailed information regarding the market situation that describes the good or service of interest, e.g. its current and alternative quantities, qualities, institutional arrangements that affect the provision of the good, geographical location, its expected duration over time, and, most importantly, the stream of expected nonmarket benefits (and costs) that are generated by the good. For example, in the case of farmland, this approach may entail describing the location, amount, spatial distribution, and types of farmland; the ownership of the farmland and the factors that influence the decision of the landowner to keep the land in farming; and the external benefits and costs that are conveyed by the farmland to the community. Given a full description of the good or service in question, the respondent is asked whether he/she would be willing to pay varying amounts of money to maintain the provision of the good in question. These responses are then combined with a variety of socioeconomic data on the individual respondents to estimate a willingness-to-pay function that describes the demand for the good in question and yields a total marginal willingness-to-pay measure that represents an estimate of the marginal benefits derived from the good. The primary advantage of this approach over revealed preference methods is that

nonuse values can be estimated. However, this approach suffers from a number of well-known limitations, including concerns over whether potential strategic behavior on the part of the survey respondent, incomplete information, the payment vehicle, and the hypothetical nature of the question may introduce estimation biases.

Several studies have used CVM to estimate the nonmarket benefits of farmland.[4] These studies have elicited willingness-to-pay estimates either by asking whether the respondent would be willing to pay a specified amount to avoid the conversion of neighboring farmland to an urban use or by asking whether the respondent would vote yes or no to set aside a targeted amount of farmland. For example, Beasley, Workman, and Williams (1986) used photographs of different development density scenarios and a bidding game technique to elicit the respondent's maximum willingness-to-pay annually to preserve farmland as a means of prevent development of surrounding land. They find that willingness-to-pay for preserving farmland increases from $76 per household annually to $144 per household annually when the alternative to farmland is high vs. moderate density development. Bergstrom, Dillman, and Stoll (1985) also present individuals with a series of photographs that depict prime agricultural land and alternative states of development and then solicit willingness-to-pay for prevent conversion of the prime agricultural land to development. They estimate that the mean annual willingness-to-pay of households ranges from $5.70 for 18,000 acres of preserved agricultural land to $8.94 for the preservation of 72,000 acres of agricultural land. As summarized by Heimlich and Anderson (2001), the range of values estimated by the CVM studies are in part due to variations in the study areas. The Beasley, et al.

4 Again, we focus on studies that have considered farmland explicitly vs. other types of open space. Studies that have used CVM to value the benefits from other types of open space include Willis, Garrod, and Saunders (1995) (environmentally sensitive areas), Bonnieux and Le Goffe (1997) (landscape restoration), Breffle, Morey, and Lodder

study is in an agricultural region of south central Alaska, where agricultural land is relatively scarce whereas the Bergstrom, et al. study is in the Piedmont region of South Carolina, in which agricultural land is probably more plentiful. Rosenberger and Walsh (1997) use a CVM study to estimate households' total annual willingness-to-pay to protect (or avoid the loss of) valley ranchland for different regions in Colorado. They find that willingness-to-pay is the highest for ranchland in the valley that is under the most urbanization pressures: average annual household willingness-to-pay to protect 25%, 50%, 75%, and 100% of the existing ranchland in this valley is $72, $102, $118, and $121 respectively. Other CVM studies that have been employed to value the nonmarket benefits of farmland include those by Krieger (1999), Halstead (1984), and Bowker and Didychuk (1994). As reviewed by Heimlich and Anderson (2001), these studies are similar in terms of the type of question posed to the respondents and range in estimated mean annual willingness-to-pay per 1,000 acres of farmland from $1.08 - $49.80. In contrast to most valuation studies, which posit development as the alternative state, Drake (1992) estimates households' willingness-to-pay in Sweden of keeping land in an agricultural use vs. letting it be converted into forest land. He estimates the average annual individual willingness to pay to preserve the land in agriculture to be 541 SEK/person and finds that this value varies on a per hectare basis depending on the location of the land and the type of agricultural land use. Lastly, Ready, Berger, and Blomquist (1997) conduct a CVM analysis to compare these results from the findings of their hedonic analysis. For the case of Kentucky horse farms, they find that median willingness-to-pay per household per year varies from $0.49 to prevent the loss of one horse farm to $681 to prevent the loss of 75% of the horse farms within their county. This finding is

(1998) (undeveloped land), and Willis and Garrod (1993) (natural landscape).

consistent with the estimated marginal willingness to pay that was generated by the hedonic analysis.

An alternative method for eliciting stated preferences for social benefits associated with nonmarket goods is contingent choice or conjoint analysis, which relies on indirect methods in a hypothetical situation to elicit an estimate of marginal benefits. This method focuses on stated preferences between defined alternatives to estimate marginal values associated with a heterogeneous good, e.g. housing. These preferences can in turn be used to elicit willingness-to-pay measures and to predict demand for particular attributes. This method presents survey respondents with two or more alternatives, each of which are described by a set of attributes. For example, in the case of housing, this list may include house size, lot size, distance to work, the amount of surrounding farmland, the quality of local public services, and price. Respondents are asked to either rank the alternatives or simply choose the alternative that they like best. Because respondents are also given the price of each alternative, they can be viewed as making choices subject to a budget constraint and analysis can be carried out within a utility theoretic framework. The resulting estimates can be used to calculate an individual's marginal willingness-to-pay for any of the attributes that were used to describe the hypothetical good and, summed over the entire population, this approach provides a means for estimating the total marginal benefits associated with the attributes of interest. While this method suffers from some of the same criticisms that CVM does—namely, that it is derived from hypothetical vs. observed behavior—it is based on an indirect method of eliciting preferences and therefore may not suffer from as many of the limitations that many believe hamper CVM.

A few studies have used contingent choice to investigate the nonmarket value associated

with farmland as a neighborhood amenity. The Johnston et al. (2001) study estimated a contingent choice model (in addition to the hedonic model discussed above) to estimate mean willingness-to-pay measures for the preservation of several different types of natural lands, including farmland. Contrary to the hedonic estimates, the per household annual value of preserving an acre of farmland is estimated to be $0.143. As emphasized by Johnston et al., this difference reflects the different values that are captured by the contingent choice vs. hedonic methodologies: the hedonic approach offers only a partial estimate of value whereas the contingent choice approach is able to capture both use and nonuse values. Roe, Irwin, and Morrow-Jones (2002) use conjoint data from a survey that collected responses to hypothetical housing choices to estimate the value of permanently preserved agricultural land around a home. The findings indicate that the conversion of 10% of all existing agricultural land within one mile of the house (about 188 acres) into permanent cropland has a value ranging from 1% to 4% of the value of the house being considered. For the median respondent and the median valued house this estimate is found to correspond to an annual mortgage payment increase of $277, which translates into an annualized value of $1.47 per acre per household or, capitalized into the value of a home, a $3,607 increase in price of the median house.

In summary, results from the different studies that have attempted to identify the amenity values associated with farmland vary with the type of methodology used, the accuracy of the data (e.g. parcel vs. county-level), the alternative land use that is considered, and the location of the study area. Nonetheless, the general conclusion based on these results is that the amenities associated with farmland are positive, which indicates that, because these values are not reflected in the market price of agricultural land, farmland is an underprovided good. For this reason, a

variety of policies have been put forward to secure the amenities associated with farmland. We review these policies and the empirical evidence regarding their efficacy in the following sections.

**Policies for Securing Farmland Amenities**

Various regulatory, incentive and acquisition devices are employed by governments at all levels to retain the many services of farmland, including amenities. By influencing the terms of trade in land markets, these institutions will be at least partially reflected in land value.

Regulations. Land use regulations adjust the rights and responsibilities of landowners to protect the Apublic health, safety, morals and general welfare," to varying degrees in different places. Agricultural zoning and urban growth boundaries are the most commonly used regulations to affect patterns and timing of land use change in the interest of protecting the open land amenities. When land use options are constrained by regulation, there is presumably a wealth transfer from owner to the general public, measured as the increment of land value associated with the present value of expected future returns to that land in a foregone higher value use. The equity question involves a judgment as to whether the owner=s sacrifice is more than offset by gains to others. In the Kaldor-Hicks sense, if those who gain from land regulation *could* compensate the owner and still come out ahead, the change in rules is a welfare gain, whether or not the compensation actually occurs.

Agricultural zoning was first used in Pennsylvania and California in the early 1970's and there are 21 states with agricultural protection zoning in the year 2002 (AFT, 1997). Most are Ainclusive@ agricultural zones permitting residential, commercial, and sometimes even industrial land uses in an agricultural district, relying on minimum lot size of twenty acres or more to

discourage but not prohibit non-farm development. A few states have Aexclusive@ agricultural districts (e.g. Pennsylvania, Maryland and Oregon) that permit only those land uses consistent with active farming. Effect of a zoning ordinance on the market value of land would depend on how the presence of that land use restriction influences willingness to pay in the land market. The buyer has to consider how limiting the rules really are, and whether local authorities easily and frequently change the restrictions.

The other equity question with agricultural zoning is whether such restriction of private property rights may constitute a regulatory Ataking@ under the 5th Amendment to the US Constitution. The case evidence suggests that since farming is generally an economically viable use of land, agricultural zoning does not constitute a regulatory taking requiring Ajust compensation@ (see Cordes, 1999 and 2002).

Incentives. State-enacted property tax reductions for active farms attempt to provide a management incentive that will keep the farmer farming longer than if Afull market value@ were the basis for farmland taxes. Since virtually all active farmland in all 50 states is eligible for use value assessment or a state income tax credit if property tax exceeds a threshold level of household income, it is doubtful that these tax programs affect land value substantially. There are various forms of tax recapture among the states to discourage conversion and reimburse other taxpayers for past incentives paid. In most cases, it is a 3 to 5 year rollback of the difference between farm and full market value. California requires the farmer to dedicate his land to farming for a running 10-year period in return for lower taxes. Other states have a capital gains tax provision to enable the community to recapture a portion of the capital gain that comes when farmland is developed. The community generated much of that capital gain through investment in roads, sewer, water

and other infrastructure, and takes some of it back when the farmland is developed (see AFT, 1997, p.145-167).

Whatever the recapture provisions, tax incentives only retain farmland amenities so long as the value of the incentive plus any penalties for change is greater than the return to an alternative land use. Except for the California case with restrictive easements in return for lower taxes, full discretion remains with the landowner. That is the nature of incentives.

Purchase. Agricultural easement or development rights purchase programs are in place in 20 states. Farmers may sell the right to develop their land at a price reflecting the difference between farm and full market value. These programs are a Abeneficiary pays@ strategy of farmland protection that generally constitutes permanent protection of the amenity services that flow from that land. Those who stand to gain from those amenities pay the farmer for them, rather than requiring that the farmer provide them in the public interest.

Once the development right has been transferred to a state or local government or a qualified land trust, future land use options are constrained, presumably affecting the land=s market value. As always, however, opportunities are in the eye of the beholder. Perhaps a buyer will place higher value on protected land because of those restrictions. Assurance that the land cannot be developed may be worth something to the buyer, not the usual discounted value of future income from the land but the value the buyer places on long term, often multi-generational, amenity attributes. A very wealthy buyer may be looking for a suitable estate with plenty of space around the Amanor house.@ The land might be available at nearly farmland value if an easement is in place, though the buyer is interested only in the amenity services and not the productive capacity of the land (ERS, 2002). In other cases, a buyer may be willing to pay more for use-

restricted land on the assumption that nothing is really forever and the restrictions can be changed in the future. All states except New Jersey have Aescape clauses@ built into their agricultural easement programs that permit government to release the restriction under extreme circumstances. Maryland and Pennsylvania require a 25 year waiting period before any such escape can even be requested. In Massachusetts, specific legislation to release an easement is required. Most programs allow a house or two for family members, up to 10 such lots in Maryland. There is virtually no experience with escape from permanent easements, leaving judgment on the matter up to the buyer. But it is doubtful that price of protected land will reflect the full value of the easement sold to the state or local government, at least not for long.

**Impacts of Amenity-Securing Policies on Farmland Value: The Evidence**

The effects of land use restrictions on the market value of farmland are not as straightforward as one might expect. As noted above, buyers will consider various indicators of future earning potential in making a purchase offer and policy-driven use restrictions are only part of the picture. Similarly, the seller=s reservation price is affected by expectations of future earning as conditioned many economic and social factors. As discussed above, homebuyers value proximity to protected open land and will pay more for those homes (Nelson, 1985; Pollakowski and Wachter, 1990). Recent work by McGranahan (1999) shows that people do move to places with significant amenities, and being close to open land has an impact on buyer willingness to pay. There was a 25% difference between parcels just inside and those outside the urban growth boundary around Portland, Oregon (Nelson, 1988). At least part of that difference could be attributed to the amenity value of nearby open space. Properties adjacent to the designated

greenbelt around Boulder, Colorado were found to be 32% higher than those less 3/4 of a mile away (Correll et al., 1978). Thus, amenity-securing restrictions have value to those who can find unprotected land nearby to build on. The scarcity value of developable land must also be a factor in these cases.

Non-voluntary development restrictions through zoning will likely cause a wealth transfer to unrestricted land. Growth restrictions explained more than two-thirds of the value difference of farmland in development as compared to non-development zones in a suburb of Minneapolis (Gleeson, 1979). Vaillencourt and Monty (1985) found a 15 to 30% reduction in farmland value as a result of exclusive agricultural zoning near Montreal in the Province of Quebec, Canada.

Farmland value is affected by *anticipation* of regulations designed to protect amenity values. Beaton (1991) examined open land price trends near the Pinelands area of New Jersey before, during and after the enactment of growth restrictions as part of the Pinelands Protection Act of 1979. Prior to enactment of the Protection Act, land value within the area later designated for preservation rose at a slower rate than other land. During the several years of debate on this land use control measure, land prices within the study area rose more rapidly than outside the Pinelands area. The market was picking up the possibility of future restrictions on land use options. As the date of the 1981 implementation approached, land value in the area to be protected rose to a level 228% higher than similar land in a control area. After implementation, value of land within the preservation area fell back to previous levels, tempered somewhat by a waiver provision to correct for any major hardship by landowners caught by the restrictions.

Nelson (1986) found little speculative value capitalized into rural land prices close to the urban growth boundary (UGB) around Salem, Oregon within five years of program enactment. In

fact, farmland close to the boundary was less valued due to various spillovers from urban activities across the border. Rural land values increase with distance from the UGB. On the other hand, the market value of land on the urban side of the boundary increased due to proximity to the amenities of open land. He found urban land within 1000 feet of the boundary to be worth $1200 an acre more (in 1979) than land closer to the urban center (p.163-169).

Buyer and seller expectations about the real effect of land use restrictions are further revealed with the Aurban growth boundaries@ (UGB) in Oregon. Knaap (1985) found major differences in land value impacts of the growth controls among different areas around Portland, depending on degree of enforcement. Purpose of the limitation on non-farm development in the Aexclusive farm use@ (EFU) districts outside of Portland was to avoid direct displacement of farms and a pattern of land use that would seem to signal the end of active farming in the future. Allowances were made for construction of new homes related in some way to the farm or if the new homes were on low productivity land and would not destabilize the existing land use pattern (Liberty, 2001, p.56). Minimum parcel size of 80 acres was enforced in most of these agricultural zones. Again there were qualifiers -- a county could petition to have a smaller minimum parcel size. The list of uses permitted within an EFU has gradually expanded over the years.

The many opportunities for making exceptions to the intent of urban growth boundaries have planted the seed of potential higher value use in the minds of farmers and developers alike. For example, 1300 new Afarm dwellings@ were approved in several counties outside the Portland UGB while actual number of farms and people declaring farming as their primary occupation declined in those counties during the same five year period (Liberty, 2001, p.62-66). Thus it appears that in fact much of the land outside the UGB is available for non-farm residential

development, perhaps with a little extra effort by the developer. Further, the urban growth boundary is up for revision every few years, with much negotiation over how much additional urban land is needed to meet commercial and residential needs. Certainly the willing buyer and willing seller of Oregon farmland would be influenced by those possibilities.

Analysis by Nickerson and Lynch (2001) bears further evidence that buyers and sellers are willing to project more possibilities for protected land than may be suggested by the use-restricting instrument. Their study of development rights purchase and transfer programs in three Maryland counties indicates that even with permanent liens against any future development, A... we find little statistical evidence that voluntary permanent preservation programs significantly decrease the price of Maryland farmland@ (2001, p. 350). Their judgment is that land market participants do not expect the restrictions on development to be truly permanent, even with no firm evidence to the contrary. There is no history at all of easement extinguishment to give hope to buyer or seller of farmland, yet hope remains, backed by willingness to pay prices higher than those than can be explained by farm income flow alone. More data are needed, more sales of farmland carrying permanent restrictions against development, to enable researchers to separate the component of land value attributed to buyer confidence that no land use restriction is forever.

Exclusive agricultural zoning is far less permanent than a development right purchase program. Henneberry and Barrows (1990) found that the value of farmland near Beloit and Janesville, Wisconsin was actually *enhanced* by restrictive zoning. Land in larger parcels further from these urban centers showed a larger value increment from zoning than smaller parcels closer to the cities, exactly the opposite from what we might expect based on location alone. The authors concluded that farmers were willing to pay more per acre for large parcels with

development restrictions to avoid some of the pressures of urban incursion into farm areas. Further, Wisconsin=s use-value assessment law requires that land first be zoned exclusively for agriculture, thus perhaps some of that price increment was really capitalized property tax reduction.

In Baltimore County, Maryland, heavily restricted land sold for more than land with less restriction. Farmland permitting one residence for every 5 acres sold for nearly $1000 less than land permitting one residence per 50 acres (Bowers, 2002). Observers in that state say that a Acountry manor@ factor is at work in Baltimore County. Wealthy urbanites from Baltimore or Washington will pay more for a well-zoned rural estate than one that is less restricted. They are paying for isolation rather than development potential, and are confident that a segment of the market will always have such buyers.

Farmland enrolled in current use value assessment programs throughout the country generates land taxes based on the productive potential of that land as calculated by a net land rent formula in each state. That farmland value is typically only a fraction of the price a farmer would pay another farmer for the land. Purchase of development rights programs in the 20 or so states that have them pay the farmer the difference between appraised full market value and appraised farm value of the land, which will nearly always exceed the value for use value taxation. Thus general use value assessment is not an important factor in farmland value. Tax relief granted to land enrolled in the Michigan Farmland Protection Program does affect land value, accounting for over 8% of price in a recent study. This increment of land value captures at least a portion of benefits amounting to an 80-90% reduction in taxes for the eligible farmer (Anderson and Bunch, 1989).

The Conservation Reserve Program, enacted as part of the 1985 Farm Bill, leases erodible land from farmers to capture an amenity or reduced run-off. Shoemaker (1989) determined that the CRP contract was capitalized into land value, but primarily as a result of the bidding procedure that paid farmers more for marginal land than rents from farming it.

**Conclusions**

In summary, farmland value is a reflection of the returns to the various services that flow from that land. Among the attributes that contribute value to farmland are certain amenity characteristics. As reviewed in this paper, some of the amenity services of farmland are exclusive and rival, and therefore can be captured by the owner and priced for purchase by consumers. Farmers in urbanizing areas find these farm-based amenities to be important income sources enabling them adjust to local economic realities. Various policies and programs help the farmer consider and undertake these new enterprises. Other amenities are public goods that are nonexclusive and/or nonrival in consumption and therefore are not reflected in market price of farmland. These external benefits create a divergence between private and social returns to farmland and, as a result, a myriad of policies have attempted to correct for this market failure by targeting farmland amenities.

The experience with amenity-securing policies throughout the country is extensive. Evidence of how those policies affect land use patterns and value comes from case studies, statistical analyses, and from more general conclusions about changing patterns of land use. We draw the following conclusions from our review of this broad literature:

1. Policy interventions by state and local governments to protect the amenity services of

farmland do have a modest effect on land use patterns, but much evidence suggests that this is true only in the short term. The regulations, incentives and spending programs are well intended, but many times have been found to be unable to withstand intense and prolonged pressure for change. Competing land uses press at the policy boundaries and the value of farmland amenity services is implicitly compared with returns to an alternative use. Home rule, the annexation power, state property rights protection statutes, local referendum authority, and the "takings issue" in general create a climate within which amenity protections are fragile at best. Other developed nations have far less trouble protecting rural land; home rule and takings are unique American institutions (Alterman, 1997).

2. Because U.S. amenity policies tend to be short-lived and readily adjusted by local governments, they appear to have had little effect on farmland value. Buyer expectations of future returns include the likelihood of development that would displace the amenity.
3. In some cases, amenities are the *most* important services of a land parcel, reflecting scarcity of open land and location relative to non-farm population. The amenity is actually more valuable in the market than the possibility of development. Under those circumstances, policies designed to protect amenities will actually increase or at least not diminish the land value.

While we believe that these conclusions apply broadly to many of the policy studies considered in this paper, our conclusions are limited in several ways. First, we have ignored the potential external costs associated with farmland. A variety of negative externalities may be

associated with farmland, e.g. odors, noises, and congestion on roads due to slow moving farm vehicles. Although we have ignored these in our discussion here, a comprehensive approach to optimal policy design would take these considerations into account as well. Secondly, our discussion has virtually ignored the issue of how farmland should be spatially distributed relative to people in order to maximize social benefits. Studies that have estimated the benefits of farmland tend to represent location in relatively simplistic ways, e.g. distance to nearest farmland or the proportion of land within a given neighborhood that is farmland. While this gives some indication as to how individuals value the relative location of farmland, such findings do not provide any real insights into how farmland should be distributed at a regional level relative to the spatial distribution of population and other features of the landscape. For example, if proximity to farmland is valuable, then to what extent should plots of farmland be scattered throughout residential development to minimize any one person's distance to a plot of agricultural land vs. should farmland be preserved in contiguous tracts of land that enable economies of scale and preservation of a wider range of amenity services? Considerations of how policymakers should interpret individual-level values of farmland in terms of what this implies for optimal regional patterns of farmland preservation are complex and the current body of literature does not provide sufficient insights into how to translate individual-level values into optimal patterns of farmland at a community level.

Despite these limitations, the empirical evidence on farmland amenity values and the policies that have been used to secure these amenities does provide insights for policymakers. They provide a range of evidence of the positive amenity values associated with farmland and therefore provide the rationale for programs that seek to secure these amenities.

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