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**Estimating the Benefits to Local Stakeholders from  
Agricultural Conservation Easements**

by

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**Introduction**

Politicians, lobbyists, social scientists, and other observers of public services share a vital interest in the question of who benefits and who loses from the service programs. Satisfied program clients may provide essential political support for sustaining or expanding services, while the actual or imagined losers may combine to terminate or curtail them. Beneficiaries and losers may be called the program's "stakeholders," that is, individuals or groups "that might be affected by the outcome of something" (Shafritz and Russell, 2000).

This paper maps out the varied beneficiaries for a local government service that is relatively new and likely to expand in its geographic incidence and total taxpayer dollars spent--employing public funds to prevent conversion of land out of farm use by purchasing agricultural conservation easements. Beginning in 1977 with the first purchase by New York's Suffolk County, local governments in coastal states, as well as some in the Midwest and other interior regions, have bought easements to prevent current and future owners from developing farmland for nonagricultural purposes (e.g., residential, commercial). But the owners "retain all other rights and responsibilities that go with land ownership, such as the right to sell the property and liability for property taxes" (Daniels and Bowers 1997, p. 145). As of mid-2002 twenty-three states had established state-level programs for purchase of agricultural conservation easements (PACE) that collectively protected more than 800,000 acres (American Farmland Trust, 2002a, 2002b). And there were at least 51 local-level programs.<sup>2</sup> An easement's cost per

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<sup>2</sup> In 2001 the American Farmland Trust published an inventory of "41 independently funded, local . . . [PACE] programs in 14 states" (American Farmland Trust, Farmland Information Center, 2001. *Fact*

acre is normally the difference between the land's appraised fair market value with all ownership rights intact and its appraised value "after restrictions on nonagricultural use are imposed by the easement" (American Farmland Trust 1997, p. 98).<sup>3</sup>

The 2002 Farm Bill promises considerable support to existing and new PACE programs. For the six fiscal years 2002 to 2007, it authorizes \$597 million in federal matching funds with which the USDA may pay up to 50 percent of the cost of individual easements purchased from landowners by states, tribes, local governments, and nonprofit organizations such as a land trust (US Department of Agriculture, 2002).<sup>4</sup>

Even with generous matching funds from the federal government and/or from state PACE programs, local taxpayers are likely to shoulder significant burdens. To fund the local shares of easement costs, they will be asked to pay extra fees (e.g., for licenses) or taxes such as on retail sales, property, or real estate transfers (Veslany, 2001; Daniels and Bowers 1997). Are the costs to those taxpayers offset by sufficient benefits?

Using printed and Internet sources, we identified various types of local stakeholders who may reap significant benefits, depending on the kind of farmland to be protected and how well it is managed after the conservation easement is imposed. For example, if the candidate parcel for protection is visually attractive farmland located along a well-traveled public road, producing locally marketed fresh fruits or vegetables, and managed by a conservation-minded farmer, the likely beneficiaries are diverse and potentially numerous. Commuters and "Sunday drivers" may enjoy the scenery, shoppers may buy fresh produce, and residents down-stream may receive less stormwater runoff than if the land had been developed into a subdivision. Varied agricultural interests may also benefit: current and future farmers who need the protected land for their operations, agribusinesses serving that farmland (e.g., a fertilizer dealer), and other farmers who worry that further losses to the agricultural land base may cause needed farm service businesses to close or leave the area. Conversely, protection of a parcel located far from a public right-of-way, producing exclusively for distant markets, and lacking a good steward as manager would benefit fewer types of stakeholders--perhaps only the seller of the development rights and the agricultural interests listed in the previous sentence.

Besides direct personal benefits--like scenery, food, wages, profits, and avoidance of flood damage-- there may also be what economists call "non-use" values (Goulder and

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*Sheet: Status of Selected local PACE Programs* (Washington, DC). Professor Al Sokolow, University of California at Davis, found ten more in three of the same states (personal communication, May 10, 2002).

<sup>3</sup> The more lenient those restrictions such as regarding the number of homes that can be built for the owners' children, farm workers, and others, the greater the residual value and the smaller the conservation easement's purchase price. In the Peninsula Township (Michigan) program, landowners could "elect to retain the right to not more than one building site per 20 acres for residences as long as the building sites do not detract from farm operations" (Bidwell et al., 1996, p. 33).

<sup>4</sup> Data on expenditures authorized for the Farmland Protection Program were available at the website of the National Association of Conservation Districts, May 8, 2002. "2002 Farm Bill Finalized": <http://www.nacdnet.org/govtaff/FB/status.htm> [accessed May 11, 2002].

Kennedy 1997) that local residents realize through a PACE program. For example, voters who never venture into wild spaces may nevertheless support a bond referendum for easement purchases in order to protect wildlife habitat. Other local residents may be largely motivated by the goal of preserving their community's "rural heritage" even though they rarely if ever visit or drive by their area's remaining farms.

Our literature search identified ten types of potential local beneficiaries:<sup>5</sup>

1. Owners of the agricultural parcel(s) being considered for the local PACE program (i.e., the "subject parcel").
2. Buyers of that farmland after its development rights have been removed.
3. Owners of adjacent or neighboring land that becomes more valuable for farming or residential development after the subject parcel is prohibited from being developed.
4. Local travelers driving, biking, walking, or boating past the farmland in question who enjoys its scenery.
5. Local residents who find recreational opportunities (e.g., hunting, fishing, bird watching) on the farmland being considered.
6. Consumers who purchase fresh fruits, vegetables, or other agricultural products grown on that land.
7. Owners and employees of local businesses providing goods and services to the subject farming operation.
8. Owners and users of downstream land who avoid nontrivial flood damage or flood-control costs because storm water runoff from the subject parcel is significantly less than if the same land were developed for housing or commercial uses.
9. Users of downstream water who avoid the costs of sediment build-up or water pollution from chemicals because the subject parcel remains in farm use rather than converted to housing/commercial uses.
10. Local residents having no direct contact with the subject land or the consequences of how it is managed (e.g., the amount of stormwater runoff), but who value farmland preservation for protecting wildlife habitats, rural "history and heritage," curbing urban sprawl, or achieving other civic purposes.

This list of stakeholders is not exhaustive. Omitted are various public and private groups and agencies that can be affected by a PACE program (e.g., USDA agencies, the Army Corps of Engineers, developers, and realtors). However, our paper focuses on local residents who are likely to benefit from agricultural conservation easements.

### **Comparing Estimates of Benefits to the Cost of Purchasing the Easement**

This paper suggests ways for measuring benefits in dollar terms (tables 1 and 2). In some parts of the country such measurements may not be politically necessary, at least in the short-run. Enthusiasm for farmland preservation as a public policy goal and acceptance of conservation easements as appropriate means to that end may obviate the need for in-depth analysis. Alternatively, local or state law may impose selection criteria like quality of the soils, the beauty of the scenery, or protection of the environment (Hellerstein et al.

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<sup>5</sup> Especially useful sources about the amenity values of farmland are: Bergstrom 2001; Bromley, 2000; Hellerstein et al. (2002), Olson (1999), Libby and Irwin (forthcoming), and Libby and Stewart (1999).

2002). But there is no associated requirement to measure whether the likely benefits resulting from parcels satisfying those criteria are sufficient in the aggregate to justify the costs of an easement. However, since so much public money--federal, state, and/or local--may be involved, we recommend that benefit-cost analysis be applied to at least the more expensive cases.<sup>6</sup> Otherwise, mistakes may be made that hurt the program's long-term political viability, as well as wasting public money on land yielding inadequate benefits while better parcels go unprotected.

The particular form of benefit-cost analysis recommended in this paper is limited on the "cost" side to the purchase price of the easement. Other types of costs could be addressed, including the "opportunity costs" of the higher property and other taxes foregone by not permitting a farm parcel to be developed into residential or commercial uses. However, we are interested in the more basic calculation problem of whether estimated monetary benefits of retaining the land in agriculture equal or at least come close to the cost of the easement, itself.

### **Focus on Local Programs**

This paper focuses on county and municipal PACE programs rather than state or federal for two main reasons. First, we were interested in using the concept of "stakeholders" to improve public understanding of the conservation easement approach to farmland protection. Our purpose seemed more likely to be achieved if we applied the concept to farmland close to where many citizens live, work, commute, or otherwise directly experience the effects of how the land is managed. Second, much land appropriate for agricultural conservation easements will never be protected unless local taxpayers are convinced that the benefits to them and/or to their community are worth the cost of the easements. Federal and many state grant programs require local matches. Also, local governments have the option to finance purchases exclusively from their own resources. There is a number of local programs already established,<sup>7</sup> and the much-enlarged pool of federal matching funds discussed above should allow the launching of new ones.

### **Types of Stakeholders:**

#### **1. Owners of Farmland Being Considered for Agricultural Conservation Easements** *Monetary and Non-Monetary Benefits*

Surveys of actual sellers of agricultural conservation easements (Elconin and Luzadis 1997, Sherman and colleagues 1998, Ferguson and Cosgrove 2000) identified a variety of financial benefits that owners have realized. Some used the easement proceeds to cover immediate debts from recent crop losses or serious family illnesses, while others allocated the money to pay down mortgages, save for retirement, build a new home, or fund other non-urgent family needs. A third category of financial objectives has been to improve the farm operation, such as by adding land or livestock or by diversifying products (e.g., building a plant to process the dairy herd's milk). Yet another use of

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<sup>6</sup> In one Maryland case, the easement price for 155 acres was \$1,235,800 (program records, October 2002), while in a New York case, the county government paid "just under \$1.9 million for the development rights for the 228 acres" (Office of the County Executive County, Suffolk County, July 15, 1998, "Acquisition is Third Largest in History of Suffolk's Farmland Program").

<sup>7</sup> See footnote 2.

easement money has been to facilitate the transfer of the farm to the next generation. Easement payments have allowed owners to stash away inheritance money for the children not interested in farming and then to hold on to the land and equipment destined to the one or more heirs who wanted to farm. Otherwise, an equitable distribution of the estate would require sale of some or all of the farm's assets. The transfer can be easier even without a bequest. A Vermont participant reported that "the removal of development rights has been the only way" his son-in-law could afford to buy the farm, because it greatly reduced the appraised value (Ferguson and Cosgrove 2000, p. 19).

The same surveys found also benefits that were at least in part non-monetary. For example, a dairy farmer in the Massachusetts PACE program sought to preserve the land for his sons who he hoped would "continue on [farming it] until they retire" (Sherman and colleagues 1998, p. 11). A participant in the Marin County (California) program said, "I really didn't want to live anywhere else. . . . It's a nice place to live and it's where I work" (Rilla and Sokolow 2002, p. 20). Elconin and Luzadis (1997, p. 9) concluded from a study of Vermont participants, "Granting [an easement] is a deliberate, rational decision which leads to the protection of cherished physical and emotional resources."

#### ***Net Benefits to Owners and Competition with Expected Development Sales in Future***

The direct monetary benefit to owners selling easements is reduced by the cost of appraisals, surveys, and other aspects of the sale process (e.g., lawyers' fees--Table 1). Those costs may discourage participation in PACE programs, as does an expectation that several years down the road the farmland will be worth much more money if its development rights remain intact. Increases of several thousand dollars per acre may be realistic as development elsewhere in the same geographic area eats up the buildable land and therefore makes the remaining good parcels more valuable. However, owners may be persuaded to sell easements *now* if convinced that the proceeds, by themselves or along with the sale value of their protected land, will appreciate to a level competitive with what they would likely receive in the *future* if the development rights had not been sold. Druffel and Barkley (1998) addressed this issue in their study of the PACE program of Washington's King County. After identifying at least one comparison parcel for each of 56 program parcels, they found that the yield from investing the PACE payments at 6 percent compound interest, plus "the current market value of the restricted land," tended to be greater than the market value of the paired parcels with their development rights intact.<sup>8</sup>

Also, when the current owners or their heirs want or need to sell down the road, there may be obstacles. The housing market may be in a slump; or growth management movements may succeed in electing majorities to town or county boards who impose

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<sup>8</sup> American Farmland Trust (2001) published a guide to agricultural conservation easements in California's Central Valley that helps landowners understand the circumstances in which they would be financially better off selling an easement rather than waiting to sell for development.

zoning constraints, if only for a few years, including the time during which the owners wish to sell.<sup>9</sup>

<b>Table 1. Estimating local benefits of proposed agricultural conservation easements, by type of stakeholder and by type of benefit: Land's current owner(s), successor owner(s), and owners of adjacent and neighboring land</b>		
<b>Type of Local Stakeholder</b>	<b>Type of Benefit</b>	<b>Value of Benefits</b>
<b>Owners of farmland being considered for an agricultural conservation easement</b>	<i>Monetary benefits:</i> Money to save for retirement, to pay off mortgage or other debt, to cover medical bills and other family needs, to expand or diversify the farming operation. <i>Non-monetary benefits:</i> Satisfaction from continuing to work and live on cherished land; from maintaining a family tradition of farming that land.	Monetary benefits to the owners should equal at least the dollar amount paid for the easement less their costs for negotiating the easement, such as for appraisals, surveys, and lawyers' fees.
<b>Buyers of farmland with development rights removed</b>	With its development rights removed, the land should be more affordable.	Estimated difference between (a) the land's sale value if the development rights were intact and (b) its current value with the easement.
<b>Owners of adjacent agricultural land</b>	-- Their land may earn higher rents than if the adjacent farmland were developed for housing. -- Alternatively, because many easement programs give priority to land contiguous with farmland already in the program, owners of adjacent agricultural land may be courted for future purchases of easements. -- Value of adjacent land for residential use may be higher because of its proximity to the open space amenities provided by the protected land.	-- Estimated difference in rents with and without the adjacent farmland developed for housing. -- Estimated development rights' value of adjacent land that owners are willing to enter into the PACE program. -- Estimated increase in residential-use market value of the affected neighboring land.

## **2. Buyers of Farmland with the Development Rights Removed**

Feinberg (1997, p. 37) differentiates between the "original grantors" of conservation easements and "second generation landowners." As discussed earlier, most farmers may not be able to afford the land unless its development potential has been extinguished. The monetary benefit to "second generation" owners would therefore be the difference between what they paid for the land and the price they would have faced if the development rights were intact. However, if speculators believe that the easements are not really permanent, they may bid up the "protected" land's price so that buyers for farm use cannot compete (Nickerson and Lynch 2001). Also, buyers seeking hobby farms or estates may inflate prices beyond levels that farmers can afford.<sup>10</sup> Hopefully, neither of these farmer-unfriendly scenarios will prove to be widespread.

<sup>9</sup> In California's Marin County some landowners sold easements because at that time "they had no other options for realizing a major economic gain from their land" due to county land-use restrictions that prevented residential or commercial development (Rilla and Sokolow 2002, p. 17).

<sup>10</sup> Nickerson and Lynch (2001) offered this second potential explanation for their findings from a study in three Maryland counties that the differences in per-acre sale prices of land under agricultural conservation easements and the prices for unrestricted farmland were not statistically significant, various competing determinants of price controlled for.

### **3. Owners of Adjacent Land and Other Near-by Properties**

#### ***Owners of Adjacent Farmed Land***

How one parcel of land is used may significantly affect the value of adjacent and other nearby properties. Agricultural rents on those parcels may decrease because of nearby housing development. Operators may avoid renting them or expect a discount because of the problems often encountered when farming near non-farm residences--including trespassing that damages crops, vandalism of farm equipment, and complaints about farm odors, noises (e.g., late-night harvesting), dust, and chemical drift (Esseks and McCallister 1986, Lisansky and Clark 1987, Handel 1999).

*Estimating Differences in Agricultural Land Rents:* If someone like a Cooperative Extension economist or a farm management consultant keep records of local agricultural rents, there may be the bases for pertinent comparisons, i.e., the rents charged for pairs of parcels of sufficiently similar sizes, shapes, slopes, and soils, but with one of the pair situated next to residential development and the other located without such neighbors.

Another benefit that owners of adjacent farmland may enjoy is its attractiveness for future purchases of conservation easements. Many PACE programs give priority to farmland contiguous with parcels already under easements (Hellerstein et al. 2002). The advantages of preserving large contiguous blocks include the just-mentioned reduced chances of conflicts with nonfarm neighbors and also the greater likelihood of economies of scale, as well as retaining in one area enough clients to support viable agri-business services (Daniels 1998).

#### ***Owners of Adjacent Residential-use Land***

Homeowners often pay more to live next to or within view of permanent open space. For example, Handel (1999, p. 65) found that vineyards on the edge of the City of Napa "provide the open space ambience for adjacent urban neighbors, and those houses sell for higher prices than similar ones down the street."

The amenity benefit may not be limited to immediately adjoining land. A Maryland study estimated that, if easements preserved a hypothetical 10-acre parcel "located in the center of a low-density residential development," the home sites would increase in value by \$10,403 to \$52,014 for every acre of protected open space, depending on that development's density (Libby and Irwin, forthcoming, p. 14).

#### ***Estimating Dollar Value of the Residential Amenity Benefit***

When the number of buildable homes on neighboring land is kept insignificant by firmly entrenched zoning or perhaps by natural resources constraints (e.g., insufficient potable groundwater or adverse topography), there would be no point in estimating the enhancement in property values due to a nearby parcel of protected farmland. However, if many new building lots are likely (let us say at least 10), the residential amenity benefit is probably worth predicting, such as by:

- asking local planners for their best guesses as to the likely zoning for the area over the next five years,

- asking realtors to forecast the marketable types of homes and approximate rates of build-out given such zoning, and
- then employing an appraiser to predict the likely values of homes with and without the nearby protected farmland. If no appraiser is competent to make such estimates, there are analytical techniques for indirectly estimating the enhancement due to the PACE land.<sup>11</sup> Since a professional appraisal or these alternative analyses are likely to be expensive, their costs should probably be left to the direct beneficiaries, i.e., the owners of the adjacent land. The latter may need the analysis to determine how to proceed with marketing their land.

Whatever the estimation technique used, we recommend that the predicted amenity value *not* be considered as a benefit to offset the cost of the agricultural conservation easement. Residential development on adjacent parcels may seriously undermine the easement's effectiveness. As mentioned earlier, many PACE programs aim to purchase the development rights for several contiguous farm parcels (Hellerstein et al., 2002), in part to promote economies of scale and also to avoid conflicts between farmers and non-farm neighbors over odors, dust, etc. Daniels and Bowers (1997, p. 167) warn, "If a PDR [purchase of development rights] program is weakened by inappropriate zoning, easements may be purchased on only a few farms that then become isolated among developed properties."

#### **4. Local Travelers Enjoying Scenery**

##### *Agricultural Viewscapes*

A type of stakeholder benefit that we *do* recommend as counting against easement costs is the enjoyment of viewing farm scenery. The land being considered for an easement may be situated along relatively well-used public right-of-ways--roads, walking/biking paths, or waterways--and may be visually very attractive. Conversely, the subject parcel could be obscured by trees or hills or simply too far away to be appreciated; or it could consist of uninteresting or ugly land (i.e., strewn with trash, rusted equipment, or other eyesores).

Some states have identified agricultural landscapes that deserve to be preserved (Olson 1999.) In the absence of already developed inventories or to supplement them, local communities may use their comprehensive planning process to designate the views they want to protect. Alternatively, they may conduct special rating exercises, such as by convening a focus group of citizens to evaluate photographs of candidate fields and associated farm structures. In rating ten photographed farmland scenes, a Georgia focus group of urban/suburban residents "reacted positively to wooded areas, livestock and animals, farm buildings, topography, and irrigation equipment and negatively to other types of farm equipment, old farm buildings, silos and harvested areas" (Patterson et al. 2001, p. 1).

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<sup>11</sup> The hedonic pricing and contingent valuation methods are discussed in Libby and Irwin, forthcoming.



### *Estimating Monetary Value of Agricultural Scenery to Potential Viewers*

Here are some suggested steps for translating reactions to photos into estimates of the monetary value of preserving agricultural scenery:

- The first step would be to ask a focus group from the local community to look at a set of photographs representing experiences they might have, some of which they pay for and some, like viewing farmscapes from a road, for which there is normally no charge.<sup>12</sup> If the exercise includes other fee-less enjoyment like visiting a city park, the valuation exercise should yield more benefits to policy makers than if it focused exclusively on farmland. Among the fee-paying experiences might be buying a well-known brand of candy bar or renting a DVD.
- Then the surveyed citizens would be asked to assign a dollar or cents value to the fee-less experiences, including viewing from public roads several different farmscapes, in comparison to the cost (given to the respondents) of the candy bar, video rental, or other popular item such as a hamburger meal. Participants would be told that, if the farmland views were not important to them, a zero valuation was perfectly acceptable. Also valid would be small valuations like a penny to five cents.
- To arrive at an estimate of the yearly value of an agricultural viewscape, the average monetary value assigned to that view by the surveyed citizens would be multiplied by an estimate of the total persons likely to pass that scene in a year's time. The latter estimate could be derived from mechanical traffic counts for the relevant road. Alternatively, volunteers interested in farmland preservation might count by hand road traffic and/or the persons on walking/biking paths (or using waterways) from which the subject farm parcel can be viewed. Roads used by large numbers of commuters would produce the highest counts.

## **5. Local Residents Enjoying Recreation on Agricultural Land**

### *Fee-paying Recreation on Farms*

In a study of the interdependency between rural and urban areas, Butler (2002) inventoried a sizable number of recreational and entertainment experiences that city and suburban residents may enjoy on farms and ranches: "hunting, bird watching, hiking, u-pick activities, boarding horses and horse-back riding, or family attractions like a 'maize-maze,' a pumpkin patch, hayrides, gardening classes, dinner in the garden, music in the barn, or over-night accommodation" (p. 8). Libby and Irwin (forthcoming) used the term, "agri-tainment" when discussing the willingness of tourists in Ohio to "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 . . ." (p. 8). Among the fees reported for hunting rights on farmland have been \$8,000 a year for use of duck blinds, \$150 a half-day for quail hunting (Libby and Stewart 1999), and \$600 a day for "access to prime deer habitat" (Libby and Irwin, p. 9). Among Internet listings of the hourly charges for horse-back riding on farmland were rates of \$18 and \$23.<sup>13</sup>

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<sup>12</sup> A charge might be considered as being imposed when motorists use a tollway or parkway.

<sup>13</sup> See, for example, the listing for a Wisconsin farm: [www.redridgeranch.com/ride.htm](http://www.redridgeranch.com/ride.htm) [accessed January 4, 2003].

**Table 2. Estimating local benefits of proposed agricultural conservation easements by type of local stakeholder and by type of benefit (continued)**

Type of Local Stakeholder	Type of Benefit	Annual Value of Benefit
<b>Local travelers enjoying scenery</b>	Farmland being considered (FBC) for a conservation easement may offer travelers attractive scenery viewable from public roads, walking or biking paths, or waterways.	Average weekly users of all right-of-ways multiplied by 52 (weeks) and by the average value per trip attributed to that kind of view by participants in a local focus group.
<b>Local residents enjoying recreation</b>	FBC may be opened for on-site recreation (hunting, fishing, hiking, horse-back riding, bird watching).	Average of past two years' fees for recreation on the FBC.
<b>Local consumers of fruits, vegetables, and other products</b>	FBC may produce locally purchased fruits, vegetables, sod, livestock feed and/or other products.	Average of past two years' local sales of products raised on the FBC.
<b>Owners and employees of local businesses providing goods and services to the farm parcel under review</b>	FBC's operator or owner purchases goods (seeds, fertilizers, pesticides, equipment, fuel, etc.) and services (grain storage, banking, custom harvesting, etc.) from local providers.	After adjustment for the value of local inputs counted above for "Local consumers," a computerized input-output model estimates the aggregate locally retained value of the FBC's purchases of labor, seed, chemical, and other inputs.
<b>Owners/users of downstream land</b>	Less stormwater runoff may be predicted, given the FBC's water absorption and storage capacities, compared to runoff estimated from land if developed for housing.	Estimated annual dollar value of flooding costs (damage to properties or infrastructure) that are <i>avoided</i> because storm water runoff is expected to be less if the FBC is kept in agricultural use rather than converted to housing.
<b>Users of downstream water</b>	Less water pollution from sediment, and/or chemicals may be predicted, given the expected management practices for the FBC, compared to pollution estimated from land if developed for housing.	Estimated total annual value of downstream pollution costs (e.g., dredging of sediment, loss in fish harvests) that are <i>avoided</i> because water pollution is expected to be less if the FBC remains in agricultural use rather than converted to housing.
<b>Non-user benefits to the broader community</b>	Among residents with no direct contact with the FBC, there may be satisfaction from protecting wildlife habitats, preserving rural "history and heritage," or achieving other civic benefits.	Randomly sampled households are surveyed about how much, if any, they would be willing to be taxed extra to achieve such benefits. Then the average of their responses is multiplied by the full number of households from which the sample was drawn.

*Estimating the Dollar Benefits of On-farm Recreation:* Many or most owners of farmland proposed for conservation easements may not be selling hunting rights or in other ways inviting visitors to recreate on the land. Sokolow and Lemp (2002) concluded from their studies in California that worry about tourists interfering with farm operations or suing if they are injured (or imagine they have been hurt) causes most farmers interested in easement programs to reject public access. Applicant owners who do allow it should be asked to provide data on the last two years' gross receipts and to estimate, at least roughly, the proportion of total clients who are local. Let us say that the farmer and family operate a horse-back riding business and that about 75 percent of their riders are local rather than week-end visitors from local government jurisdictions that do not help to

pay for the PACE program. Presumably, the worth to the local clients of that land remaining in agricultural use should equal at least what they pay for the horseback rides. The full monetary value might include, besides the per-hour fees, the costs of traveling to and from the farm (Goulder and Kennedy 1997).

There may be nontrivial numbers of persons who enjoy recreation on the subject farmland *without paying fees*. Residents surveyed in a sample poll could be asked to assign dollar values to a day of hunting, a morning of fishing, or afternoon of hiking (for three examples), either in generic terms or in response to photographs of farmland like the subject parcel. But the survey sample would need to include sufficient respondents who do hunt, fish, or hike.<sup>14</sup>

Alternatively, if the farmer or land owner has reasonably accurate counts of the non-fee-paying visitors, analysts could assign a *minimum* value to each visit equal to the likely cost of driving a private car to and from the farm. For example, the farm might be an average of 3.5 miles from the centers' of the nearby large town's five major residential areas. The average round-trip travel cost by car would then be  $3.5 \times 2 \times$  some acceptable per-mile value for owning and operating a car. The American Automobile Club provides this information by region, broken down into operating and ownership costs (finance, insurance, license, etc).<sup>15</sup> Let us say that 60 cents is the region's per-mile cost. Multiplying 7 miles by 60 cents gives us a minimum value of the recreation visit to the farm in the sense that, if the visitor did not value the recreation as worth at least the cost of traveling, he/she would not bother to go there.

## **6. Local Consumers of Fresh Fruits, Vegetables, and Other Agricultural Products**

A national survey of registered voters conducted in June 2001 found that 70 percent of the total of 1,024 respondents said they had bought something in the past year "directly from a farmer, such as from a farmer's market or at stand at a farm or ranch."<sup>16</sup> Another direct marketing channel for local farmers may be "community supported agriculture," that is, subscription services whereby consumers contract with farmers for regular supplies of produce and/or other food that is delivered to their homes (Imhoff 1999). Area farmers may also supply local consumers indirectly through local grocery stores.

Nationwide, relatively few farmers market directly to consumers; one estimate is 3 percent of all farmers (Egan, 2002). This proportion tends to be higher in metropolitan areas because of their farmers' proximity to large numbers of consumers. According to

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<sup>14</sup> An earlier section of this paper discussed estimating the dollar value of driving past scenic farmland. Presumably, almost all members of the focus group would have past experiences of that kind with which to frame their estimates for the subject parcel.

<sup>15</sup> Automobile Club, Southern California. *Your Driving Costs in Southern California*, available at [www.aaa-calif.com/members/corpinfo/costbrch.asp](http://www.aaa-calif.com/members/corpinfo/costbrch.asp) [accessed February 18, 2003].

<sup>16</sup> American Farmland Trust, 2001. "Summary of poll results," in *Special Report: America's farms and ranches are important to the nation's voters*: available at [http://www.farmland.org/news\\_2001/071101\\_survey\\_main.htm](http://www.farmland.org/news_2001/071101_survey_main.htm) [accessed December 24, 2002]. When the sample was expanded later that summer to 2,216 respondents, the percentage was 69 percent.

USDA's Economic Research Service, "61 percent of U.S. vegetable production is located in metropolitan areas" (Heimlich and Anderson, 2001, p. 4).

Another nontrivial category of local "consumers" may be farm operators and/or agricultural supply firms. They may purchase livestock, grain for feed, and other inputs for farming that are raised on the farm being considered for a conservation easement.

#### *Estimating the Dollar Value of Local Sales from the Subject Farmland*

Presumably, for tax purposes the farm operator keeps records of sales by commercial buyer and by groups of individual buyers such as those patronizing their farm stand at a market or on the farm itself. The combination of sales to local stores and direct sales to individual customers and households would represent, at least in gross terms, the monetary stakes that local consumers have in keeping the subject farm in agricultural production. Adjustments to that estimate would be needed if significant amounts of the sales to local stores were re-exported to outside the community, or a significant proportion of direct sales is to out-of-area customers. An example is when the producers deliver organically grown vegetables to restaurants several hours away, or if, let us say, Chicago-area families stop at Wisconsin farm stands before returning home after a weekend trip. A reduction would also be required if the records of sales were kept for the whole farm, but the owner intended to sell a conservation easement for only part.

The out-of-area customers are welcome since they provide jobs for workers and patronage for other local suppliers of farm inputs. The dollar value of that business should be incorporated into the estimates for our next category of stakeholders ("Local Providers of Agricultural Inputs"). However, our analysis of this category-- local consumers -- focuses on the extent to which they have stakes in keeping a local farm in agricultural use. Other things being equal, policy makers for a PACE program should find a parcel that provides food for significant numbers of local dining tables or that supplies shrubs, trees, or perennial flowers for many yards in the community to be more appealing than a farm turning out crops only for distant markets.

### **7. Local Providers of Agricultural Inputs**

Virtually all agricultural producers in this country purchase some inputs--such as seeds, fertilizer, equipment, fuel, pesticides, bank loans, and labor. Although consolidation in the input sector and Internet purchases have regionalized much of this activity, some inputs are still likely to be obtained from local suppliers. Collectively these suppliers may comprise an important group of direct stakeholders for a PACE program. Strongly interested in the viability of these input providers may be a group of indirect stakeholders -- farmers who have no intention to offer any of their own land to the program but who fear the loss of seed dealers, equipment repair shops, and other essential agribusiness services if too much farmland is converted. When local suppliers close, costs of services may increase, promptness of service may worsen, and producers may begin to disinvest in farming. Out of what has been called an "impermanence syndrome," they cease to repair fences, keep up drainage tiles, maintain the sizes of livestock herds, and in other ways sustain the productivity of their operations (Conklin and Leshner 1977; Nelson 1998).

### *Estimating the Value of a Farm's Purchases of Local Inputs*

The subject farm's business records should include expenditures by vendor if not by type of input. Production costs per acre may be substantial. For mid-to-late season sweet corn in Pennsylvania, they were estimated to total \$1,155 an acre in the year 2000.<sup>17</sup> For loose leaf lettuce production in California in 1996, they consisted of \$482 per acre in pre-planting costs, \$1,091 in cultural costs, and \$2,730 for harvesting (Takele, Aguiar, and Walton 1996). By contrast, for field corn in the country's Heartland Region, the corresponding per-acre estimates for 2001 totaled to only \$250.<sup>18</sup>

In any effort to aggregate the dollar value of different kinds of local stakes in preserving a farm parcel, we need to avoid double-counting. Accordingly, if the subject land produces local sales of feed grains, fruits, vegetables, ornamental crops, etc., we should subtract estimates of the cost components of those sales already counted for the previous category of stakeholders, "Local Consumers." Let us say that local sales were produced by 25 percent of the total acres planted to sweet corn grown on the farm being considered for an easement. A cannery in the next county bought the other 75 percent.

The value to local businesses and workers from the remaining three-quarters of total acreage should be calculable, using an input-output model like IMPLAN (Mulkey and Hodges nd). With data on output revenues, purchases of inputs, and the proportions of the latter supplied locally, IMPLAN estimates (among other things) how changes in one "industry" (e.g., "Food Grains") affects other industries (such as "Agricultural Chemicals") in the same county, group of contiguous counties, or state. The input-output estimates of interest to this part of our paper are those for "value added" lost, that is, the decreases in wages, salaries, and investment income that local citizens experience when a business like a farm closes. The value added payments represent local stakes in that closure, that is, money that would otherwise have remained in the local economy rather than the farm expenditures that end up in the hands of businesses located out of the area (like manufacturers of fertilizers). For example, when IMPLAN was applied to Brown County, Wisconsin, it estimated that 40 cents of every dollar that agriculture paid to local construction firms was valued added, while for a dollar going to transportation, utilities, and communications, the corresponding value was 60 cents (Deller 1993).

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<sup>17</sup>This was the amount estimated when the corn was harvested by hand. The machine-harvested cost was \$1,019 per acre (Pennsylvania State Cooperative Extension, *Agricultural Alternatives*: [http://agalternatives.aers.psu.edu/crops/sweet\\_corn/index.htm](http://agalternatives.aers.psu.edu/crops/sweet_corn/index.htm). [accessed January 12, 2003]). In an e-mail message dated February 14, 2003, Professor Michael D. Orzolek of Pennsylvania State University provided the crop year for these cost estimates.

<sup>18</sup>The land's rental rate is excluded because it is paid to the owners, and in this part of the paper we are interested in payments to other stakeholders. Also not included is the "Opportunity cost of unpaid labor," because we are focusing on actual payments. The source is: USDA Economic Research Service, "Data: Commodity costs and returns," available at <http://www.ers.usda.gov/Data/CostsAndReturns/data/current/C-Corn.xls> [accessed December 26, 2002].

*"Multiplier" Effects:* Construction and other workers serving farms probably spend most of their earnings locally. The subject farm's fertilizer dealer may also buy most of his/her household goods locally, as well as purchase business inputs from local sources (such as a local bank or vehicle maintenance shop). In other words, the subject farm's payments to input suppliers circulate, and their impacts multiply.<sup>19</sup> After an input-output model estimates these "multiplier effects," the analyst can present the full stakes that local input providers have in retaining the land in agricultural use

## **8. Owners and Other Users of Downstream Land**

### ***Stakeholders for Retaining the Farmland's Capacities to Prevent or Reduce Flooding***

Flood damage results from the volume and velocity of stormwater runoff or snow melt. Farmland being considered for a conservation easement may help downstream users of land to avoid the costs of flooding or of installing flood-control structures. While individual PACE parcels may not be large enough to make a significant difference for many parcels below them in their watershed, even modest-sized farmland can absorb or detain enough stormwater to prevent substantial damage to its immediate neighbor or to property a parcel or two away. Unless it has steep slopes, pasture land should be effective in reducing runoff. Cropland can be good if applied to it are appropriate conservation practices (e.g., reduced tillage, contour cropping, or terraces). Arnold and Gibbons (1996) cite an EPA study predicting that:

- about 10 percent of the rain runs off when the land is in "natural ground cover" [or well-managed pasture],
- the runoff proportion increases to 20 percent when impervious surfaces range from 10 percent to 20 percent (low-density housing), and
- it climbs to about 30 percent if the imperviousness varies from 35 percent to 50 percent of the total surface.<sup>20</sup>

Who can be hurt by the increased runoff when farmland is converted to housing? In a survey of 281 farmers operating next to rural residential subdivisions in three urban-edge counties of the Chicago Metro region, 19 percent of the sample reported that stormwater runoff from the adjacent homes caused nontrivial yield losses (Esseks and McCallister 1986).<sup>21</sup> Too many square feet of the subdivisions consisted of rooftops, driveways,

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<sup>19</sup> A report by USDA's Natural Resources Conservation Service used IMPLAN to estimate the employment, sales, and value-added effects of converting 1,000 acres of rice production to wetlands (Ransom and Buland 2000). Separate multipliers were calculated for (a) the food grains industry (including its operators, landowners, and workers), (b) businesses outside that industry but serving it like maintenance and repair, and (c) "households and institutions affected by the initial loss in Food Grains total sales" (p. 24). The model estimated that, "For each dollar of lost rice sales, 76 cents of value added (income) is lost in the Food Grains Sector . . . 8 cents is lost in a ripple effect to other businesses in the Region, . . . [and] 32 cents of income is lost to households" (p. 25).

<sup>20</sup>Imperviousness above 50 percent may indicate apartment houses or commercial uses.

<sup>21</sup> Not all surveyed farmers were downstream of the subdivision. Many were upstream. Sixteen percent of the total sample reported problems with damaged drain tiles and ditches that they attributed to the subdivisions.

patios, tennis courts, horse barns, subdivision roads, and other impermeable surfaces, relative to any stormwater management structures that had been installed. Downstream residential properties may also be negatively affected.

### ***Estimating Savings from Prevention of Flooding***

As a first step, the analyst should probably consult with a hydrologist knowledgeable about his/her area for help in deciding how to frame the analysis. Is the subject farmland large enough and the topography such that it is useful to look for differences in downstream flood or erosion damage beyond only adjacent and other nearby properties? The next step would be either to apply some very general rules<sup>22</sup> for comparing runoff with farmed versus residential uses or to employ a site-specific tool like the Natural Resources Conservation Service's procedures described in its "Technical Release 55 (TR-55)."<sup>23</sup> These procedures incorporate data on 24-hour rainfalls and measures of soil and ground cover as proxies for both "potential maximum retention after runoff begins" and of "losses before runoff begins."<sup>24</sup> After using the formula to estimate flows given the current agricultural uses, the analyst adjusts it for the higher level of impervious surface attributed to building of houses at a density that experts consider likely.

If the difference is substantial and neither natural nor man-made protection is likely to be available to the nearby properties, the area of flooding should be estimated. In the case of farmland, the operators may know from past storms which parts of their fields are particularly vulnerable. The area estimates may be based on the sum of those parts plus some multiplier to account for the greater volume of runoff. Lastly, the number of acres likely to be affected are multiplied by the likely revenue per acre that would be lost and the result converted into an annual average. Among the operators in the Illinois study cited earlier who reported crop losses due to stormwater runoff from nearby subdivisions, the median estimated loss was \$200 per year and the 75th-percentile value, \$431 (Esseks and McCallister 1986).

## **9. Local Users of Downstream Water**

### ***Types of Benefits: Reduced Delivery of Sediments.***

If farmland is retained in agricultural use, landowners and other users of downstream water may enjoy benefits other than flood control -- including reduced delivery of sediment and chemicals in the runoff water. In other words, even if the amount of water draining off the subject parcel does not increase, the pollution of that volume may worsen because of housing development. Heimlich (2001) discusses a sediment delivery model for which one of the three predictors is "land cover." Housing use may yield more sediment overall because of the absence of cover during construction time,

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<sup>22</sup> By "general rules," we had in mind the USEPA runoff ratios cited by Arnold and Gibbons (1996) discussed above.

<sup>23</sup>"Technical Release 55 (TR-55) presents simplified procedures for estimating runoff and peak discharges in small watersheds" (USDA, Natural Resources Conservation Service, 1986, *Urban Hydrology for Small Watersheds* (Washington, DC), p. 1-1.

<sup>24</sup>*Urban Hydrology*, p. 2-4.

which could be lengthy depending on the total number of units built and the expected build-out rate, which is a proxy for the time land is without sufficient surface cover.

Another predictor is "the flow path length from the field to the nearest stream" (Heimlich 2001, p. 19). For example, if the path is long enough or the build-out sufficiently quick, the volume of sediment delivered to the watershed may be little different or even less than if the land were kept in farming. A third predictor is the land's slope. It may be gentle enough that little soil erosion occurs. However, if the formula indicates significantly more erosion under the most likely development scenario, it may be worth trying to estimate the cost savings from the land remaining in agriculture. For example, a 100-acre parcel might be close enough to a recreational lake or trout stream that sediment-loaded runoff during a prolonged construction period would cause substantial damage.<sup>25</sup>

#### *Reduced Delivery of Chemical Pollutants.*

Stormwater runoff carrying fertilizers and herbicides used on residential lawns may become a serious pollution consequence of housing built on former agricultural land. But since farming on the same land probably also uses pesticides and chemical fertilizer, a net benefit from agricultural use would require less quantity or toxicity per acre. Farmers generally are more informed on the importance and safety as well as appropriate levels of fertilizer and pesticide to apply. They must be certified to apply restricted use products.<sup>26</sup> They also have a large economic stake in decisions about levels of application, unlike most urban dwellers. The latter also face no requirements for education on use of pesticides and their safety.

From a water-quality perspective, an organic farm should be clearly superior to housing, unless the residential development proposed for the same land included very good barriers to chemicals entering streams (e.g., vegetated swales and ponds for extended detention -- Ewing 1996). Best management practices on non-organic farms can also minimize chemical-laden runoff. Tippett and Guglielmone (1993) report the findings of an Illinois study that compared in-stream nutrient concentrations given different widths of vegetated buffers along the streams. If the buffers were less than 100 feet, the model predicted a 140 percent increase in nitrates under urban use compared to the level from farming, while buffers of 200 to 400 feet reduced it to 55 percent, and a range of 400 to 1,000 dropped it to 20 percent. The estimated changes were negligible only when the buffer exceeded 1,000 feet.

#### *Estimating Costs Avoided from Sediment and/or Chemical Runoff*

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<sup>25</sup>The American Farmland Trust worked with other conservation organizations, including Trout Unlimited, to purchase conservation easements to farmland along a creek in Wisconsin that was threatened with development and that offered particularly good habitat to brown trout ("Trout Benefits from Well-Managed Farms," *American Farmland: The Magazine of American Farmland Trust*, Summer 2002, pp. 5-6).

<sup>26</sup> See, for example, information on California's regulatory program: California, Department of Pesticide Regulation, *Licensing and Certification Program*: available at [www.cdpr.ca.gov/docs/license/liccert.htm](http://www.cdpr.ca.gov/docs/license/liccert.htm) [accessed February 20, 2003].



The farm parcel being considered for an easement may be too small or far from a stream or other body of water to promise much savings in sediment-removal. As mentioned above, sediment delivery varies indirectly with the length of the "flow path." However, that distance may not be great; and records of public works or recreational agencies may show that in similar situations housing development on farmland leads to costly dredging of streams and lakes or cleaning out of culverts and other drainage structures. Those costs should be converted to a per-acre average for as many years as the likely duration of the bond used to finance an easement--let us say, 30 years.

A search of records may also find nontrivial costs from chemical-laden runoff, such as fish kills in a recreational stream or lake. Nitrogen in water stimulates the growth of algae that, when it dies and decomposes, uses up oxygen which fish and their food plants need.<sup>27</sup>

Although there may be no recorded losses, the fact of significant savings in chemical-polluted runoff may be established, such as by random water samples taken before and after a similar farm parcel was converted to housing. These findings could be applied to the final, tenth category of benefits that we discuss below--amenities that are known to exist but difficult to express in monetary terms.

#### **10. Local Residents Valuing "Non-user" Benefits**

So far in our inventory of the potential benefits of an agricultural conservation easement, we have focused on local stakeholders who come in direct contact with the subject parcel or with the consequences of how it is managed. They include its owner, the owners of neighboring land, and persons who may enjoy its scenery from a public right of way, may hunt on it, hike there, eat fresh produce grown there, earn money from owning or working at a business providing inputs to that farm, or avoid flood damage to their own properties or sediment build-up in, or chemical pollution of, water courses they use (because the subject farmland is upstream from them and environmentally well managed).

However, though lacking direct contact with that agricultural land, sizable "non-user" groups within the local population may have a conscious or latent interest in preserving it in farm use. They may, for example, state in a survey that they value farmland preservation as a means to protect the locality's "heritage and history" (Furuseth 1987, p. 55), because it preserves wildlife habitat (Kline and Wichelns 1996), or since it helps to curb urban sprawl (Krieger 1999). In the absence of direct contacts, there is no chance to record market exchanges, such as when residents pay for fruit at a farm stand, or to infer payment, such as when we use records of past flood damage to estimate costs avoided if the land were to remain in agricultural use.

Instead, we may ask representatives of the broader community how much they would be willing to pay in extra taxes to achieve the non-user benefits. Either with carefully structured focus groups or with random samples of citizens interviewed in person, there

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<sup>27</sup>US Environmental Protection Agency, Mid-Atlantic Integrated Assessment, *Eutrophication*, available at <http://www.epa.gov/maia/html/eutroph.html> [accessed December 28, 2002].

is the opportunity to provide information, including photographs, that the participants need in order to make informed statements of willingness to pay. Rather than questioning respondents exclusively about agricultural conservation easements, the focus group or survey should query also about the dollar value to participants of other policy objectives, such as improving public education, fighting crime, and expanding the system of public parks (Krieger 1999). If farmland preservation were the sole purpose being evaluated, citizens might agree to be taxed for it only in order to avoid appearing negative to their focus group facilitator or survey interviewers.

The participating citizens may be asked to evaluate more than one amenity attribute for farmland being considered for protection, such as its potential for providing both wildlife habitat and protection for groundwater (Kline and Wichelns 1996). There could be a set of several of amenity benefits that previous focus group discussions identified as relevant to the local community. A study of public responses to farmland conversion in Taiwan presented the surveyed citizens with 10 types of benefits--including recreation, flood prevention, water purification, and promotion of biodiversity--before asking them to estimate how much per month they would be willing to pay to prevent further loss of land and the associated environmental benefits (Chen 2002).

#### *Fiscal Savings*

In some cases, another type of non-user benefit may be savings in the costs of providing public services to the subject parcel(s). In different parts of the country, the American Farmland Trust has conducted studies of the costs of public services and found that agricultural land consistently costs less to service (i.e., for road maintenance, police services, fire protection, and other purposes) than it generates in revenue (property taxes, gasoline tax, etc.), while residential use cost more than it produces in taxes. We reviewed these studies' findings for 11 local government jurisdictions and learned that for every dollar in taxes that agricultural or open land yielded, government service costs to that class of land averaged from 21 cents to 77 cents. By contrast, from \$1.02 to \$1.67 were spent servicing residential land for every dollar received in revenue from that source.<sup>28</sup>

However, there are exceptions. Burchell (1996) has argued that expensive single-family homes may pay for themselves. That is, if the property assessments and tax rates are high enough, the revenue yield offsets the inefficiencies of serving detached homes with their typically longer road frontages and sewer and water lines (among other disadvantages), compared to attached housing. Also, some communities impose annexation or development impact fees that compensate for density-related costs (Dahlstrom 1995). Finally, the type of development planned for the subject farm parcel may clearly be a revenue-winner, such as commercial or industrial uses or vacation homes. The latter tend

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<sup>28</sup> American Farmland Trust, 1986, *Fiscal Impacts of Major Land Uses in the Town of Hebron, Connecticut* (Washington, DC); American Farmland Trust, 1989, *Cost of Community Services Study, Towns of Beekman and Northeast, Dutchess County, New York* (Washington, DC); American Farmland Trust, 1992, *Does Farmland Protection Pay? The Cost of Community Services in Three Massachusetts Towns* (Northampton, MA); American Farmland Trust, 1993, *The Cost of Community Services in Madison Village and Township, Lake County, Ohio* (Washington, DC); and American Farmland Trust, 1994, *Farmland and the Tax Bill: The Cost of Community Services in Three Minnesota Cities* (Northampton, MA).

to produce no children for the school system and to be seasonal in their demand for police, fire, and emergency medical services.

If, instead, it is likely that the land will be converted to middle-class, year-round housing, but without adequate development impact fees, a cost-revenue analysis should be undertaken to document the subsidies that all taxpayers in the school district, city, county, or other jurisdictions will likely pay to cover those new homes' services (Esseks, Schmidt, and Sullivan 1998). Many of the cost and revenue data gathered from one local study should be applicable to later analyses in the same jurisdiction and, thus, save time.

### **Aggregating Benefits across Types of Stakeholders: A Hypothetical Case**

A central concern in this paper has been the extent to which the benefits of placing a conservation easement on farmland equal or come close to the easement's cost. Therefore, we recommend measuring as many types of benefits as possible in dollar terms so that the estimated values of the different types may be aggregated.

#### *Easement's Cost per Year*

Let us say that the pending contract provides for paying an average of \$4,000 an acre for development rights to 160 acres in a lump sum of \$640,000, and that the county government will pay for it out of a 30-year municipal bond at 6 percent annual interest. The principal and interest charges work out to \$46,495 per year. Added to that sum should be the annual cost to the county of administering the easement, perhaps just the staff time devoted to inspecting the property to determine if the easement's conditions are being met. That cost might amount to another \$200 per year. Of course, if a state or federal agency shares the easement's cost, the local government will pay less.

*In this hypothetical case of an easement on 160 acres, could the measured annual benefits aggregate to, or approach, the \$46,695 in public outlays per year?* Among the ten categories of stakeholders (tables 1 and 2), whose benefits should be combined into a summary tally? Not the owners receiving the easement payments, nor future buyers of the protected land, nor owners of neighboring farmland who intend to develop it. The main purpose of the benefit-cost analysis we recommend is to determine if the money paid to the easement's sellers is offset by benefits to local taxpayers. The easement's dollar value should therefore not be counted as both a cost and a benefit, as it would be if the summary tally included the first two groups of stakeholders listed in Table 1. While the benefits flowing to the third group, owners of neighboring land, are separate from the easement's cost, developing the land would likely undermine the viability of farming on the protected land.

In the following exercise, we use conservative assumptions for the remaining stakeholder groups, aggregate the resulting estimates, and then relax two assumptions (Table 3).

***Local Travelers Enjoying Scenery.*** Let us say that land proposed for an easement is located in the country's Heartland Region and consists of 140 acres of field corn, 10 in pasture, and 10 in woodland. It forms a square with a half mile of road frontage. Let's assume that (1) focus group discussions involving local residents elicited per-trip

estimates of the value of driving by farm scenery of the type represented by the subject parcel, (2) those estimates averaged 4 cents per trip, and (3) traffic counts yielded an average of one car per minute during daylight and early evening hours (i.e., 12 hours). Those "givens" translate into 3,600 trips during the work week, valued at a total of \$144, multiplied by 52 weeks, yielding \$7,488 per year (Table 3).

***Local Residents Who Enjoy Recreational Opportunities on the Farm.*** Let us say that the farmer and his family run a horse-back riding business on the ten wooded acres and ten in pasture and that they average 20 clients a week for 9 months (38 weeks) of the year, who pay \$20 for their hour-long rides and gross for the family \$15,200. We assume that 90 percent, or 18 weekly, of these clients are local and that for them, keeping the land in its present usage was worth at least the money that they paid for the rides (18 X 38 weeks X \$20 = \$13,680).

***Local Consumers.*** If the subject farm's cropland is planted entirely to field corn, and no crop suitable for sales to local consumers is raised in the woodland or on the pasture, there would be no local residents with this kind of stake in that farm.

***Agri-businesses.*** USDA's Economic Research Service estimated production costs for corn grown in the Heartland Region to be \$250 per acre.<sup>29</sup> If only a quarter of that amount represented expenditures retained by local farm workers and agri-businesses rather than money they must pay to out-of-area suppliers, the local stakes would be \$250 multiplied by 140 (acres) and then by .25, which equals \$8,750 per year (Table 3).

So far, we have \$29,918 in combined annual benefits to a relatively sizable number of residents: the agribusiness owners, their staff, paid farm workers, the horse-back riders, and the commuters driving past the farm. The approximately \$16,800 gap between that total and the \$46,695 estimated for yearly bond and administration costs might be partially filled by the public expenditures avoided for flood damage, sediment removal, and/or fish kills.

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<sup>29</sup> For reasons discussed earlier, we deducted the land's rental value and the estimate for unpaid labor.

**Table 3. Estimated annual dollar benefits retained locally from keeping a hypothetical 160-acre farm parcel in agricultural use, by type of stakeholder and by two allocations for the 140 cropped acres**

<b>Benefits by Type of Stakeholder</b>	<b>All 140 acres in field corn</b>	<b>100 acres in field corn and 40 in sweet corn</b>
Local automobile commuters enjoying scenery as they make an estimated 3,600 trips past the farm being considered (FBC ) for an easement during the work week (assuming that travelers assign 4 cents per trip as the value of this kind of view to them)	<b>\$7,488</b> (3,600 X 52 weeks X \$0.04 per trip past the farmland)	<b>\$7,488</b>
Local residents riding horses on weekends on the FBC's 30 wooded acres and 10 acres of pasture	<b>\$13,680</b> (18 clients per week over 9 months, paying \$20 per ride=18 X 38 weeks X \$20)	<b>\$13,680</b>
Local consumers' purchases of fruits, vegetables, or other products raised on the FBC	<b>No local sales if all cropland is in field corn.</b>	<b>\$2,400</b> <b>(in local sales of sweet corn)</b>
Local businesses' and farm workers' receipts for providing goods and services to the subject farm, <i>minus</i> (a) the part already counted above under "Local consumers' purchases" and (b) the part of the remaining receipts that are paid to suppliers outside the local economy; for this exercise we assume that 25% is kept locally.	<b>\$8,750</b> (\$250 per acre production costs for field corn X 140 acres X .25)	<b>\$20,011</b> (\$250 per acre production costs for field corn X 100 acres X .25, plus \$1,155 per acre for 39 acres of sweet corn X .25)
Non-user residents who value land like the FBC for its contribution to protecting the community's rural heritage, wildlife habitat, or other civic "goods"	<b>\$1,680</b> (a random sample of interviewees representing 50,000 households and valuing such "goods" at 21 cents per family for 1,000 protected acres = 50,000 \$0.21 X 160/1000)	<b>\$4,000</b> (a random sample of interviewees representing 50,000 households and valuing such "goods" at 50 cents per family for 1,000 protected acres)
<b>Total</b>	<b>\$38,993</b>	<b>\$48,993</b>

**Non-user Benefits.** If appreciable savings related to runoff or chemical pollution are not expected, there still remains the tenth category of stakeholders--local residents not likely to experience personal contact with the subject farmland or with the consequences of its management, but nevertheless valuing its preservation and assigning a nontrivial monetary amount to that kind of non-user stake in the land. Let us say that a sample of adults with listed telephone numbers valued saving 1,000 acres of farmland as worth 21 cents per year on average to their households. The 21-cent valuation was the smallest identified in six studies reviewed by Heimlich and Anderson (2001). And if area households with listed phones totaled 50,000, we would have another \$1,680 in estimated benefits (or 160 acres divided by 1000 acres, with that ratio multiplied by .21 and then by 50,000). A 1999 study in northeastern Illinois found that the average household valuation for 1,000 acres was \$2.93 per year, while an earlier Massachusetts study identified a range of \$17.82 to \$49.80. In the aggregation of benefits we have been undertaking, a valuation of just 50 cents per household would increase this kind of benefit to \$4,000.

Another plausible change would raise the aggregate stakes close to the posited annual cost of \$46,695 for our hypothetical 160 acres. Let us say that 40 of the 140 acres of cropland were planted to sweet corn rather than field corn. If we assume production and harvest costs of \$1,155 per acre<sup>30</sup> for the 40 acres in sweet corn and \$250 for the remaining 100 in field corn and keep the 0.25 ratio for local retention of the proceeds, this category of benefit increases to \$17,800 and drives the revised aggregate annual benefits to \$42,968.

Planting some acres to sweet corn may provide the opportunity for direct sales to local consumers. If we assume an average of \$500 per week in sales at a farm stand over eight weeks, there would be another \$4,000 in gross revenues. However, adjustments are needed for both the part representing purchases by out-of-area travelers and the portion already counted in the \$17,800 of locally retained input costs. First, let us assume that the \$4,000 in sales comes from just one acre (Clark et al. 1998). We must therefore reduce the number of sweet corn acres used in calculating benefits to local suppliers from 40 to 39. That combined estimate (for field corn and sweet corn) drops to \$17,511. Then, of the \$4,000 in total sales at the farm stand, let us assume that 80 percent was bought by local consumers, yielding \$3,200 to count towards the aggregate total of local stakes in keeping the land in agricultural use. That addition raises the total to \$45,279 in annual benefits (Table 3), or close to the estimated per-year cost of the hypothetical easement, \$46,695.

## **Conclusion**

This paper argued two main points: that local stakeholders for agricultural conservation easements can be identified and their stakes can be estimated in dollar terms. Although we discussed ten types of stakeholders, the list was not meant to be exhaustive. Nor was the inventory of benefits per type. Within the confines of a single paper, we were not able to cover all possible user and non-user benefits. Omitted, for example, was a farm parcel's possible contribution to taking carbon dioxide out of the air and storing it for long periods of time (Eve et al. 2002). Also not included are possibly synergetic benefits when over time several contiguous or nearby farmland parcels come under easements. The combined scenic views, recreational opportunities, and watershed protection values, among others, may all be greater than the sum of estimated benefits of each type when the analysis is limited to individual easements.

The easement-by-easement framework used in this paper may therefore be particularly appropriate either for PACE programs that are getting started or for proposed easements that are very expensive. When individual farm properties are being considered, either as part of a general debate on a bond referendum or of a discussion on how best to spend the funds already authorized, the kind of benefit-cost analysis we recommend may be of critical importance. It presents skeptics with as full an inventory as possible of local stakeholders and the estimated extent to which those groups will benefit in dollar terms.

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<sup>30</sup> An amount estimated for Pennsylvania producers when the corn is harvested by hand. The machine-harvested cost was \$1,019 (Pennsylvania State Cooperative Extension, *Agricultural Alternatives*: [http://agalternatives.aers.psu.edu/crops/sweet\\_corn/index.htm](http://agalternatives.aers.psu.edu/crops/sweet_corn/index.htm). [accessed January 12, 2003]).

The same analysis may mobilize such stakeholders into becoming active, informed participants in the policy debate.

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