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## An Assessment of Residents' Willingness to Pay for Green Space and Farmland Preservation Conservation Easements Using the Contingent Valuation Method (CVM)

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### Abstract

In recent years, federal and state government agencies have required larger proportions of funding for environmental programs to be generated locally. Local officials want assessments of local public opinion in order to make funding decisions. Extension educators should take the opportunity to fill this important need. This article presents results of an Extension study of residents' attitudes toward programs to preserve natural areas and agricultural lands. The findings, obtained using the contingent valuation method (CVM), reveal that basic attitudes toward conservation, area of residence, and income are important predictors of residents' willingness to pay (WTP) for conservation easement programs.

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### Introduction, Problem Statement, and Purpose

During the late 1990s, an increasing number of communities throughout the United States began to witness the expansion of residential and commercial development into the countryside. The issue of land preservation became increasingly visible, especially in communities bordering on major metropolitan areas. As the discussion of "urban sprawl" became ubiquitous, articles in both the popular media and in academic journals highlighted concerns. These ranged from loss of wildlife habitat to lack of infrastructure in what were previously small towns which had in a short span of time become highly populated "bedroom communities." Extension educators across the country found themselves increasingly involved in land use issues.

Over the same period, a method of obtaining measures of public attitudes toward a variety of proposed projects, called the "contingent valuation method" (CVM), gained considerable attention among scholars, government officials, and others. With deep roots in the field of natural resource economics, CVM has emerged as a means of estimating citizens' willingness to pay taxes or fees for many public purposes, including human and social services, food safety, youth recreation programs, and local infrastructure like schools, roads, and public buildings. Extension educators who are helping communities assess public attitudes for these and other proposed initiatives will find CVM a relatively straightforward method of measuring citizen attitudes toward these and other issues.

This article explains how Extension educators used CVM to provide public officials in one community with residents' opinions on a proposed purchase of conservation easements program, including their willingness to pay to fund it. The article serves as a demonstration of the usefulness and workings of the method for the benefit of those who may want to consider using it in similar types of studies.

## **Conservation Easements**

As the land use issue has intensified nationally, one of the key tools that has received a great deal of attention among those interested in the preservation of various types of land is the conservation easement. This is a relatively new concept for many Extension educators (Seidl, 2001; Schear & Blaine, 1998).

A conservation easement amounts to a permanent restriction on a parcel of land that prevents most forms of residential or commercial development from taking place on the land. When such an easement is adopted, the landowner retains all other previous rights associated with ownership, including the right to occupy, lease, farm, or sell the land. One of the reasons this tool has received such support throughout the country is because it achieves the objective of preserving land/open space, but does not place the property in the hands of a public agency. The private landowner still has the obligation of maintaining the land and paying taxes on it (Daniels & Bowers, 1997).

Two key challenges emerge when discussing the viability of using conservation easements to protect farmland or green space. First is the establishment of a legal recognition of the easement. In other words, if a landowner places the deed restriction on the property in perpetuity, who is going to ensure that the easement is not violated in the future--especially once the ownership of the parcel is passed to another person?

The second challenge is compensation for the easement. In most cases, especially for parcels located near the rural-urban fringe, the highest market value for land is the value associated with its development potential. Once that is removed through a conservation easement, the value of the parcel typically falls, potentially to its value associated with agricultural production. Who compensates the landowner for this decline in value?

For the first challenge, a land trust or public agency that holds the conservation easement has the responsibility to monitor the restriction and to make sure it is enforced. If someone wishes to challenge the easement, however, the case will probably wind up in court. Courts may choose to recognize the easement, but if the state in which the property is located has enabling laws on the books that specifically recognize the legal status of conservation easements, the courts' discretion is removed and the easement can almost certainly sustain a legal challenge. As a result of public activism over the past two decades, most states currently have legislation that recognizes the status of conservation easements. This legislation has withstood a variety of legal challenges (American Farmland Trust, 1997).

In terms of getting landowners to place conservation easements on their property, there seems to be a consensus among government officials and preservation activists that easements should be voluntary. Two types of monetary incentives have emerged, tax relief from donation of the easement or purchase of the easement through the use of public funds.

If a landowner chooses to donate an easement, he or she is able to place the value of the donated easement as a charitable contribution, just like a donation to any other charity. In most cases, the easement is jointly held by a non-profit 501 c 3 corporation (such as a land trust) and a public agency. In many cases the public agency involved is operated locally. It may be a county-wide land preservation board, for example, with members appointed by local officials such as county commissioners.

Donation of the easement may provide a substantial monetary gain for a landowner, especially if that landowner is in a high-income tax bracket. However, for many landowners, especially farmers, donation of an easement is not economically a realistic option. This is because in many cases, the chief source of the landowner's wealth is in the land itself. Many farmers count on the appreciation of the land over their lifetimes to allow for the funding of their retirement when they decide to quit farming.

But removing the development rights from the land will typically reduce its value substantially. On the other hand, if the landowner could sell the development rights, this would immediately provide a large portion of the income normally postponed until retirement. The landowner could still sell the land upon retirement, where (s)he would then recoup the remaining (i.e. agricultural) value of the land.

Because of these considerations, obtaining funding for the purchase of conservation easements (or purchase of development rights, PDR) programs has become a significant topic throughout the U.S. (Daubenmire & Blaine, 1998). As of 2002, a total of 18 states had publicly funded PDR programs. The sources of funding for these programs range from excise taxes on cigarettes in Pennsylvania to real estate transfer taxes in Maryland.

## **Contingent Valuation Method (CVM)**

Public officials who are required to make decisions concerning the use of public funds for PDR programs often express the desire to know how their constituents feel about these programs in general, and about paying taxes to fund them in particular (Kline & Wichelns, 1994). Over the past few decades, the contingent valuation method (CVM) has emerged in the field of natural resource economics as the primary method economists use to elicit public attitudes towards funding many different types of environmental programs. Carson, Wright, Carson, Alberini, and N. Flores produced a bibliography of over 1,600 published articles using CVM (1994).

CVM seems to be especially appropriate for use in evaluating funding options for conservation easement programs because, although these programs have become very popular and widely discussed, the question as to "who pays" for them has yet to be answered in any consistent way. This is all the more important in an era of tight government budgets when local governments are being required to provide larger portions of funding for all types of programs than in previous years.

### **Study Area, Design, and Methods**

Lake County Ohio (population 228,000) is located in northeast Ohio. It is adjacent to Cuyahoga County (Cleveland), a major metropolitan county with a population of 1.4 million residents. In many ways, Lake County is typical of American communities located at the rural-urban fringe. It is rapidly urbanizing in the portion nearest the metropolitan county, has a "small town" atmosphere near the center, and has a distinctly rural ambience in the area at the furthest distance from the city.

The type of green space in the county varies considerably. It includes marshy habitat in areas near Lake Erie and a highly specialized unconventional agricultural industry primarily located in the rural portion of the county. A number of reasonably well-preserved riparian corridors offer a great deal of wildlife habitat, aesthetic (scenic) amenities, and a source of clean water for Lake Erie.

The primary agricultural enterprises are horticultural (nurseries and grapes). The enterprises differ from most agriculture in Ohio (row crops and livestock) primarily because of the local climate (microclimate influenced by Lake Erie) and because high land values typically prohibit conventional agricultural production, which tends to produce relatively low revenues per acre.

In the fall of 2001, members of the Lake County Farmland Conservation Taskforce (LCFCT) asked the Ohio State University (OSU) Sea Grant College Program and OSU Extension to assist in conducting a survey of Lake County residents' attitudes toward land use issues in general and green space and farmland preservation in particular.

In January 2002 the LCFCT and the OSU Extension office mailed surveys to 1,000 randomly selected registered voters with a cover letter explaining the survey. The letter was signed by one of the Lake County Commissioners and the Chair of the task force. The sample size and survey procedure were selected using guidelines described by Dillman (1978) and Krejcie and Morgan (1970).

A total of 24 surveys were returned as undeliverable. Initially, 250 voters returned completed surveys (early respondents). Follow-up mailings produced an additional 181 usable surveys (late respondents), bringing the total number to 431, for a response rate of 44%.

The purpose of categorizing responses into waves of early and late respondents was to allow us to test for non-response bias (Miller & Smith, 1983). Research suggests that late returns are more like non-respondents than like early returns. Later in the article we discuss the methods we used to determine whether these results indicate a problem of "non-response bias" which could potentially prevent us from generalizing to the group sampled, and to the population of the county.

### **Results: Basic Attitudes**

In the first section of the survey respondents were presented with a series of statements on land use issues and were asked to give their level of agreement on each item using a fully anchored five-point Likert scale. The scale was as follows: one equaled strongly agree, two equaled somewhat agree, three equaled neither agree nor disagree, four equaled somewhat disagree, and five equaled strongly disagree. The frequencies of responses to these items are presented in Table 1.

**Table 1.**  
General Attitudes on Preservation of Green Space and Farmland

	<b>Strongly Agree</b>	<b>Somewhat Agree</b>	<b>Neither Agree nor Disagree</b>	<b>Somewhat Disagree</b>	<b>Strongly Disagree</b>
Agricultural production (nurseries,	69%	22%	6%	2%	1%

vineyards, food crops) in Lake County is an important industry.					
It is important to protect the agricultural industry in Lake County	67%	24%	5%	3%	1%
It is important to preserve agricultural land in Lake County.	67%	22%	8%	3%	1%
The presence of farmland in Lake County offers benefits beyond the economic impact of commercial agriculture.	60%	25%	12%	3%	1%
Agriculture in Lake County helps maintain a robust diverse local economy	56%	30%	10%	3%	1%
Elected officials should understand the significance of green space preservation issues.	79%	15%	5%	<1%	<1%
It is important to preserve natural areas (green space) in Lake County.	77%	18%	4%	2%	<1%
We must increase monitoring and enforcement of existing laws to prevent damage to our natural resources.	71%	21%	6%	1%	1%
The character of Lake County should be changed to a more urbanized, developed community.	6%	10%	19%	25%	40%
It is important to reduce the impact of residential development on local water quality.	71%	17%	9%	2%	<1%

These results show that respondents overwhelmingly believe that protecting green space and agricultural areas are appropriate goals for the community. Respondents are also aware that open space offers benefits to the community that go beyond direct economic impacts from activities such as food production and tourism. Note that the amount of strong agreement on issues associated with preserving natural areas is slightly higher than for agricultural areas.

Next, respondents were given a description of a conservation easement program and asked to give their views on whether they favored the creation of the program in Lake County. The results are

presented in Table 2.

**Table 2.**  
Overall, to What Extent Do You Favor or Oppose Lake County's Participation in Conservation Easement Programs (CEP)?

	<b>Natural Areas (Green Space) CEP</b>	<b>Agricultural (Farmland) CEP</b>
Strongly Favor	61%	40%
Somewhat Favor	27%	32%
Neither Favor nor Oppose	8%	19%
Somewhat Oppose	3%	5%
Strongly Oppose	1%	4%
<b>Number of respondents</b>	417	413

These results show that a strong majority of respondents favor the establishment of conservation easement programs to preserve both natural areas and agricultural lands. Note that, as in Table 1, support is stronger for the natural areas than for agricultural lands. But in both cases there is very little opposition to the program.

**Results: Contingent Valuation (Willingness to Pay)**

In order to measure the response of residents to a proposal concerning payment of a purchase of natural areas conservation easement program we used a variation of the Contingent Valuation Method (CVM) called the payment card method. In this method various levels of payment were proposed ranging from \$0 to \$56 in irregular whole dollar increments. Respondents were asked to circle the amount they would be willing to pay annually for the next 10 years to generate local funds needed for Lake County to participate in a natural areas conservation easement program. The results are found in the Table 3.

**Table 3.**  
Willingness to Pay for Conservation Easements

<b>Annual Amount</b>	<b>Cumulative Percent of Those Responding Yes</b>	
	<b>Natural Areas</b>	<b>Agricultural Land</b>
\$56	10%	6%
\$51	16%	8%
\$47	17%	8%
\$44	19%	9%
\$37	21%	11%
\$34	28%	14%
\$29	32%	20%
\$24	52%	35%
\$19	63%	43%
\$11	74%	59%
\$8	80%	70%
\$3	85%	77%
<b>Totals</b>	<b>100%</b>	<b>100%</b>

<b>Number of Respondents</b>	<b>414</b>	<b>402</b>
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Using the results from Table 3, it is possible to calculate a lower bound mean (LBM) estimate of household WTP for conservation easements. The LBM represents a true lower bound estimate of average household willingness to pay for environmental programs. It is a conservative lower average WTP because the formula used to calculate it does not capture the interpolations of WTP that lie between the amounts offered in the survey. For example, we do not try to estimate the percentage of people who would pay more than \$3 but less than \$8 and use it in our LBM calculations. LBM is calculated by the formula:

$$(1) \text{LBM} = \pi_0(p_0) + \sum_{i=1}^k \pi_i(p_i - p_{i-1})$$

where  $\pi_0$  is the cumulative percentage of respondents willing to pay the initial or smallest finite amount offered ( $p_0$ ), and  $k$  is the number of subsequent amounts offered.

For the natural areas program, the LBM is:

$$(2) \text{LBM}_{NA} = .85(3.00) + .80(8.00-3.00) + .74(11.00-8.00) + .63(19.00-11.00) + .52(24.00-19.00) + .32(29.00-24.00) + .28(34.00-29.00) + .21(37.00-34.00) + .19(44.00-37.00) + .17(47.00-44.00) + .16(51.00-47.00) + .10(56.00-51.00) = \$23.05$$

For agricultural areas, the LBM is:

$$(3) \text{LBM}_{AG} = .77(3.00) + .70(8.00-3.00) + .59(11.00-8.00) + .43(19.00-11.00) + .35(24.00-19.00) + .20(29.00-24.00) + .14(34.00-29.00) + .11(37.00-34.00) + .09(44.00-37.00) + .08(47.00-44.00) + .08(51.00-47.00) + .06(56.00-51.00) = \$16.25$$

The lower bound mean for a natural areas conservation easement program is \$23.05 per household per year. Multiplying by the number of households in the county (89,700) yields an aggregate WTP of slightly more than \$2.0 million per year for natural areas conservation easement efforts.

The lower bound mean (LBM) for an agricultural conservation easement program is \$16.25. Again, multiplying by the number of households, we get an aggregate WTP of \$1.46 million per year for agricultural conservation easement efforts.

### **Regression Results: Willingness to Pay for Green Space Preservation**

In order to understand the characteristics of those respondents who were more (less) willing to pay for the preservation of natural areas and agricultural lands, we used a statistical procedure called multiple regression analysis. Regression is not new to Extension educators (Gorham, DeVaney, & Bechman, 1998). In this study, we used the procedure to generate an equation that expresses willingness to pay (WTP) as a function of a set of socioeconomic and attitudinal variables.

In the first analysis we specified WTP to preserve natural areas as a function of perceived importance of preserving these areas, gender, age, income, area of residence (rural versus urban), and whether the respondent replied early or late to the survey. The results are displayed in Table 4.

**Table 4.**

Regression Results: Willingness to Pay for Green Space Preservation (Model 1)

<b>Dependent Variable-WTP for Natural Areas</b>		
<b>Independent Variable</b>	<b>Parameter Estimate</b>	<b>Significance</b>
Importance of preservation	-12.22	.00**
Residence (Urban/rural)	6.94	.00**
Age	0.00	.93
Gender	1.34	.44
Income	3.40	.00**
	-0.68	.70

Early/Late		
R Square = .27 F = 20.09** ** Indicates statistically significant at the 99% level of confidence		

These results show that age, gender, and time of response (early/late) played no role in determining individual WTP. Next, we deleted those irrelevant variables and re-ran the regression, with the results shown in Table 5.

**Table 5.**  
Regression Results: Willingness to Pay for Green Space Preservation (Model 2)

<b>Dependent Variable-WTP for Natural Areas</b>		
<b>Independent Variable</b>	<b>Parameter Estimate</b>	<b>Significance</b>
Importance of Preservation	-12.14	.00**
Income	3.47	.00**
Residence (Urban/rural)	6.81	.01*
R Square = .27 F=40.70** ** Denotes statistically significant at 99% level of confidence * Denotes statistically significant at 95% level of confidence		

The results of this regression may be interpreted in a straightforward manner. For every one unit higher on the one to five scale respondents ranked the importance of preserving natural areas, residents are willing to pay \$12.14 more per year. For each income category increase (\$20,000 increments), respondents would pay \$3.47 more, and urban residents average a willingness to pay of \$6.81 more than rural residents.

All of these results are highly statistically significant, as was the equation as a whole as measured by the F statistic. The R Square value indicates that the three factors identified here explain 27% of the variation in respondents' WTP. This is a relatively high amount for this kind of analysis, but it indicates that there is still a great deal we do not know about why people support or oppose specific environmental initiatives.

The lack of statistical significance on the early/late response variable means that there is no difference in willingness to pay between early and late respondents. This is an indicator that non-response bias is absent from this study. As a result, we believe that the findings presented throughout this article can in fact be generalized to the voting population of Lake County with a margin of error of plus or minus 5%.

In any case, the analysis reveals that the profile of someone most willing to support the program is a high income urban resident who strongly agrees that preservation of natural areas in Lake County is important.

### **Regression Results: Willingness to Pay for Agricultural Land Preservation**

In the next segment, we regressed WTP for agricultural land preservation as a function of the same set of variables, this time replacing perceived importance of natural area preservation with importance of preserving farmland (also registered on a 1-5 scale). The results are presented in Table 6.

**Table 6.**  
Regression Results: Willingness to Pay for Agricultural Land Preservation (Model 1)

<b>Dependent Variable-WTP for Agricultural Land Preservation</b>		
<b>Independent Variable</b>	<b>Parameter Estimate</b>	<b>Significance</b>



Importance of Ag Land Preservation	-7.81	.00**
Residence (Urban/rural)	3.23	.17
Age	-0.05	.36
Gender	1.55	.34
Income	1.86	.00**
Early/Late	-1.90	.25
R Square = .18 F = 11.95** ** Denotes statistically significant at 99% level of confidence		

These results show that age, gender, and early/late response played no role in determining WTP. Again, non-response bias appears to be absent from the survey. Unlike the regression for natural areas preservation, however, this model shows that area of residence plays no role in estimating WTP.

In running a second regression equation, we discarded age, gender, and early/late response, but retained area of residence in order to see whether the omission of these three variables caused a change in the estimation of the impact of area of residence on WTP. The new regression is shown in Table 7.

**Table 7.**  
Regression Results: Willingness to Pay for Agricultural Land Preservation (Model 2)

<b>Dependent Variable-WTP for Ag Land Preservation</b>		
<b>Independent Variable</b>	<b>Parameter Estimate</b>	<b>Significance</b>
Importance of Ag Land Preservation	-7.71	.00**
Income	2.13	.00**
Residence (Urban/rural)	3.16	.18
R Square = .18 F = 23.14** ** Denotes statistically significant at 99% level of confidence		

Again, these results may be interpreted in a straightforward manner. For every one-unit increase in perceived importance of preserving agricultural lands, residents are willing to pay \$7.71 more to protect farmland. For every one-unit increase in income (\$20,000), they are willing to pay \$2.13 more. Unlike the case for preservation of natural areas, WTP to protect agricultural land is not related to area of residence.

The analysis reveals that the profile of someone most willing to support the farmland preservation program is a high-income voter who strongly agrees that preservation of agriculture in Lake County is important.

### **Summary on WTP for Programs**

These results reveal a number of interesting phenomena. One is to corroborate research findings that demonstrate that residents of communities located at the rural urban fringe believe that preservation of natural areas and agricultural lands are appropriate socioeconomic goals. In this particular case, the findings are to a large extent a reflection of land use patterns in Lake County itself, but they can almost certainly be applied to other similar communities across the nation. In the face of growing development, Lake County still has significant natural areas and a highly specialized intensive form of agriculture.

The results demonstrate that people who live in urbanized portions of the community are willing to pay significantly higher amounts to preserve natural areas than those living in the rural portions, but they are not willing to pay more than their rural counterparts for agricultural land preservation. This should not be all that surprising, because these urban residents probably are somewhat more sensitive to the scarcity of green space than those who live in rural areas, but they do not

necessarily associate green space itself with farmland.

At the same time, it is very important to note the meaning of the findings here with respect to the linkage between public attitudes on the importance of preservation with willingness to pay for programs designed to accomplish preservation goals. Note from Table 1 that overwhelming majorities of all respondents either strongly agreed or agreed that preservation of natural areas and agricultural lands is important. The coefficients on these variables in the regressions (Tables 5 and 7) show why this feature is so critical.

For example, in moving from "somewhat agree" on natural areas preservation to "strongly agree," the average respondent increases WTP by over \$12. The magnitude of this association is rather striking when we consider that this amount alone is over half the mean WTP for the sample.

We find the same proportion on agricultural land preservation. In moving up one unit on the "importance of preservation" scale, the average respondent's willingness to pay increases by nearly \$8.00, again roughly half of mean WTP. The similarity of these two ratios is also worthy of note.

Overall, the findings demonstrate that even though land preservation enjoys widespread support, the willingness of residents to pay money for preservation programs is extremely sensitive to their intensity of feelings toward the issue. Moving residents from "somewhat agreeing" to "strongly agreeing" with preservation objectives is highly likely to increase average WTP for conservation easement programs. Likewise, even a slight diminution of commitment to these programs by members of the public will probably cause a disproportionate decline in willingness to pay for them.

### **Conclusions: Implications for Communities and Extension Educators**

It seems obvious that as communities continue to struggle with issues of land preservation, elected officials are going to need to have information concerning their constituents' views on the use of public funds for this purpose. This is even more relevant now than in the past, because federal and state governments are increasingly requiring local matching funds for environmental programs.

Given these issues and trends, it is likely that local officials in communities across the country are going to be expecting Extension educators to provide them with information they need as they make funding decisions. Providing these officials with summaries of public attitudes concerning a variety of programs is a role that Extension educators ought to be able to play. Use of survey instruments to describe public attitudes toward environmental preservation, including estimates of willingness to pay for conservation easements obtained via contingent valuation method (CVM), should emerge as a priority in Extension in the future.

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