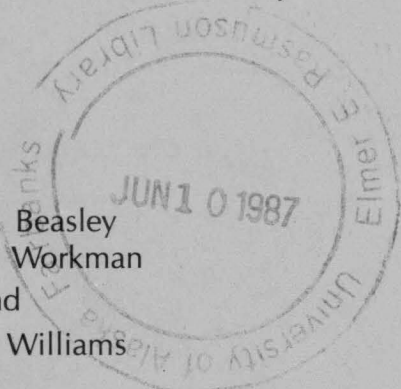


# Non-Market Valuation of Open Space And Other Amenities Associated with Retention of Lands in Agricultural Use

## The Matanuska-Susitna Valley of Southcentral Alaska — A Case Study

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*Springer Loop Road, Matanuska-Susitna Borough. Photograph  
by Steven Beasley, 1983.*

## Summary

The most productive farmland in southcentral Alaska is currently under intense development pressure due to rapid population increases and consequential increases in demand for suburban housing. This study utilizes a contingent valuation iterative bidding game to estimate the willingness of Matanuska-Susitna Borough residents to pay to preserve open space and other historical/environmental amenities associated with farming activities. Determinants of consumer behavior are addressed as well as total benefits and costs of various posited development scenarios. This information may be useful to policymakers assessing actions designed to purchase development rights from Matanuska-Susitna farmers.

# Introduction

The conversion of farmland to residential sites or to other nonagricultural uses is a significant public-policy issue in many regions of the United States and other parts of the world. In response to public concern primarily motivated by problems associated with the spatial pattern of urbanization, state and local governments have been enacting programs to control farmland conversion for some twenty-five years (Fisher 1981).

In southcentral Alaska, rapid urbanization of the Matanuska-Susitna Valley (approximately forty-five miles northwest of Anchorage) closely parallels the urbanization trends experienced in the rest of the country. Between 1975 and 1983, Matanuska-Susitna Borough officials estimate that 8000 acres of Class II and III farmlands were subdivided for residential housing purposes (Thurlow 1983<sup>1</sup>). Public outcry over what is perceived as significant losses of prime farmland during the past two decades has resulted in state and local actions to slow this conversion.

There are several factors that have fueled the demand for farmland conversion, most of which stem from population growth and the consequential increased demand for affordable housing. First, the expansion of the city of Anchorage is geographically constrained by such natural barriers as the Chugach Mountains to the north and the Knik and Turnagain Arms of Cook Inlet in all other directions. The potential for additional single-family, detached residential housing on large lots is nearly exhausted in Anchorage; hence, the prices of these houses have skyrocketed over the last decade (Planning, Inc. 1983). The Matanuska Valley, on the other hand, has ample growing space, is

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<sup>1</sup>Thurlow, Gary. Matanuska-Susitna Borough Manager. Palmer, Alaska. Personal communication. May 1983.

a relatively short commute to Anchorage, and has substantially cheaper housing prices. This area is fast earning the title of "bedroom community" of Anchorage.

Significant changes in the surrounding rural environment have resulted from increased rates of population growth and accelerated levels of housing starts in the borough; the population doubled between 1980 and 1984 (Thurlow 1984). While large quantities of wooded and other nonagricultural building sites exist in the Matanuska Valley, many builders and home buyers alike have demonstrated a preference for the cleared and, often, more convenient locations associated with converted farmland. Construction activity in general is viewed favorably in the borough due to the associated effects on economic prosperity. The same cannot be said of the residential housing development which has been occurring on farmland within the community<sup>2</sup>

Some of this development activity is occurring in the Old Colony and Homestead areas. These areas have been under continuous cultivation since the early part of this century, and the farms there are considered the "showcase" of Alaska agriculture, having significant historic and tourist appeal. What has been described as the loss of the "heart of agriculture in Alaska" accompanied by degradation in the unique scenic beauty of these areas has caused public concern.

In response to this concern, several public-policy tools have been devised to create incentives for farmers to continue farming, thereby slowing farmland conversion. Use-value assessments, agricultural restrictions, and purchase of development rights (PDR) are examples. During the 1984 Alaska legislative session, bills were introduced in each chamber to implement a voluntary program whereby the state would purchase nonagricultural development rights on farmland, i.e., a program that would retain land in agricultural uses.

The purpose of this study was to attempt to value the collective nonmarket benefits associated with farming activities in the Old Colony and Homestead areas of the Matanuska-Susitna Borough. Employ-

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<sup>2</sup>This study's survey responses, for example, indicate that 91 per cent of respondents favor continued housing development within the borough, whereas 98 per cent are opposed to this development on agricultural lands.



ing contingent valuation methods (CVM), individual perceptions of value for farm-land-associated amenities were measured and linked to causal factors through regression techniques. In addition, estimates of aggregate benefits derived from this study were combined with cost figures from previous work to assess the net social value of efforts to retain these farmlands.

## RELATED LITERATURE

Several major contributions to a definition and a derivation of social value are of vital importance in understanding CVM in the context of benefit-cost analysis. The initial contributions by Marshall (1930) can be interpreted as defining social value within the willingness-to-pay framework. Consumer's surplus is defined as the difference between the maximum value of the consumption bundle to the consumer and the amount which a consumer actually paid for it. Hicks (1943) subsequently argued that there were actually four measures of consumer's welfare: compensating variation, compensating surplus, equivalent variation, and equivalent surplus. He also showed that the four measures may differ. The Hicksian surpluses differ from the variations in that the latter are calculated after the consumer has made optimizing adjustments in his consumption set in response to price changes while the former do not permit such adjustments. Benefit-cost analysis often deals with situations in which optimizing adjustments are not possible once the quantity of a public good has been set, i.e., an individual must take this bundle as given. Individual valuations in such a context can be viewed correctly as Hicksian surplus measures.

Bradford (1970) recognized such distinctions and presented a theoretical framework for the net valuation of public goods. He suggested that traditional Marshallian demand curves are inappropriate in welfare analyses of changes in public goods. Instead of responding to parametric price per unit and thereby choosing an appropriate number of units, an individual arrives directly at a total value to himself of various given packages of the good. Bradford proposed the concept of an aggregate bid curve for a public good which is the summation of individual bids (Hicksian surpluses) over the relevant popula-

tion. The aggregate bid curve is simply an aggregate benefit curve, reflecting what an accurate benefit-cost analysis would measure as benefits.

Brookshire et al. (1980) recognized the need for further development of the basic Bradford model to be applicable to all classes of goods: divisible and indivisible in production and/or consumption, both exclusive and nonexclusive in nature. The total value model they present is particularly useful in CVM in addressing such topics as improvements in aesthetics, which, by their very nature, are more in the realm of qualitative rather than quantitative changes.

In his analysis of the demand for outdoor recreation in the Maine woods, Davis (1963) pioneered the empirical use of iterative bidding games. Davis recognized that, without market prices, efforts to derive recreational benefits for benefit-cost analysis were stymied. He suggested interviewing recreators to derive maximum willingness to pay for recreational services. These responses would then form the basis of an estimated demand curve for the services in the area as well as its aggregate value.

Randall et al. (1974) used contingent valuation to estimate empirically the Bradford aggregate bid curve for aesthetic benefits of the abatement of environmental damage from air pollution. This study influenced the analytical framework for virtually all subsequent CVM studies. Their Four Corners study focused on the design of survey instruments and explored alternative instruments to elicit bids (payment vehicles). No tests for bias were performed; however, warnings concerning the credibility of survey design in a hypothetical situation were emphasized.

Cognizant of the historical criticism of direct-questioning methods to reveal preferences (see, e.g., Samuelson 1954), Randall and others suggested further empirical investigation into a range of biases which include: 1) strategic, 2) information, 3) instrument related, and 4) hypothetical. Currently there is no general consensus among economists concerning the relative importance of the various biases. Rowe and Chestnut (1983) as well as Mitchell and Carson (1981) suggest they are an important problem in CVM studies, whereas Schulze et al. (1981) discount their practical significance.

Desvousges et al. (1983) recommend that considerable attention be given the design phase of the survey questionnaire as a means of

reducing the potential for hypothetical bias. Randall et al. (1974) outline the necessary prerequisites for successful application of CVM: (1) the nonmarket commodity must be familiar to respondents; 2) the payment vehicle must involve routinized behavior; 3) the hypothetical situation posited should be understandable and reasonable.

Mitchell and Carson (1983) suggest that a well-defined hypothetical experiment in which the Randall et al. (1974) prerequisites have been met not only will reduce hypothetical bias, but all other biases as well. This would seem consistent with an earlier assertion by Rowe and Chestnut (1983) that hypothetical bias may induce other forms of CVM bias.

In conclusion, there remains some uncertainty in the literature concerning the reliability of CVM to measure nonmarket valuations of collective goods. While the potential for bias certainly exists in improper application of this method, many researchers believe that careful design of the survey instrument circumvents these problems. As Schulze et al. (1981) point out, in many situations CVM is the only feasible method for measuring nonmarket values. Faced with the alternative of total ignorance of such values, "some information is certainly better than none."

## The Theory

The open space and environmental amenities associated with urban fringe farmlands are unpriced collective or public goods. Such goods have two distinguishing characteristics: 1) the difficulty of excluding the consumer who does not pay for the good (i.e., nonexclusiveness), and 2) that consumption by one consumer does not reduce the quantity available to others (i.e., nonrivalry) (Mishan 1969). These qualities make it difficult for market transactions to result systematically in socially efficient amounts of the collective good. First, on the supply side, the nonrivalry characteristic suggests that the cost of making the good available to an additional beneficiary is zero. This means that the socially efficient price for the good is also zero, and at a zero price no farmer-businessman would be willing to invest in supplying the good. On the demand side, since no one can be excluded from consumption, whether or not one pays for the good, individuals have no incentive to reveal their true willingness to pay for the good, and an individual can, as a free rider, still benefit from its presence.

Alaska has a great abundance of open space and related environmental amenities to offer its residents and visitors. However, since market signals are absent with regard to the production of these collective goods, there is little evidence available as to how much these amenities are worth. It seems reasonable, however, that the highest marginal value would be placed on these benefits in situations in which they are in short supply (Gardner 1977). In relatively urbanized areas, these benefits may take on a high value indeed. The importance of the environmental effects of agricultural land preservation is reflected in the criteria used in choosing among qualified parcels in a recently proposed Matanuska-Susitna Borough development rights purchase program. These criteria include: 1) agricultural productivity, 2) susceptibility to conversion, and 3) contribution to the attractiveness of the area. Based on these considerations and the associated historical at-

traction of the area to tourists, the Old Colony and Homestead lands have been singled out for preservation (Thurlow 1983<sup>3</sup>).

But what is the value of preserving the amenity benefits of these agricultural lands? If public expenditures are to be made in this effort, some notion of the return on this investment would certainly be helpful to policy makers.

## BENEFIT-COST ANALYSIS AND THE PARETO CRITERION

One of the most important concepts used in assessing the comprehensive benefits and costs of a proposed policy change is the Pareto principle, which states that the change is desirable if it makes at least one person better off without making anyone worse off (Pareto 1927). In practice, however, it is highly unlikely to have any change within a society without anyone feeling that he is worse off. This has led to the development of the benefit-cost criterion for deciding if a change is desirable. The criterion, quite simply stated, is *given the existing distribution of income, wealth, and property rights, if total benefits exceed total costs, a potential Pareto improvement exists. Potential* means that conditions exist for gainers to compensate the losers in such a manner that no one would be worse off (Kaldor 1939). Whether or not compensation should be made is generally argued to be an equity question, and is therefore not part of the economic efficiency considerations.<sup>4</sup>

It is within this benefit-cost framework that social value is defined and measured. The essential features of this framework can be summarized as follows:

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<sup>3</sup>Thurlow, Gary. Matanuska-Susitna Borough Manager. Palmer, Alaska. Personal communication. May 1983.

<sup>4</sup>It is interesting to note that, in the case of the proposed development rights purchase program, such equity questions have been explicitly taken into account. Those farmers who would lose their right to develop their property for nonagricultural use—the losers—would be paid the fair market value of that right by the potential gainers—those state residents who appreciate farmland retention.

$$NPV = \sum_{t=0}^N (B_t - C_t) / (1+r)^t \quad (1)$$

where:

- $NPV$  is the net present value of the proposed policy change
- $B_t$  represents the benefits in period  $t$  associated with the policy change
- $C_t$  represents the costs in period  $t$  associated with the policy change
- $r$  is the discount rate
- $N$  is the number of years benefits and/or costs are expected to flow from the policy change

Assuming a full accounting of both benefits and costs, a positive  $NPV$  indicates a potential Pareto improvement. Implicit in the derivation of  $NPV$  is the ability to quantify all benefits and costs in a standardized unit such as dollars. In the present study, costs are based on a hypothetical market for development rights. The benefits fall into the unpriced collective realm (i.e., open space and environmental/historical amenities) and were considered unmeasurable until quite recently.

## NONMARKET VALUATION OF COLLECTIVE GOODS: THE THEORETICAL FRAMEWORK

A useful theoretical framework for the valuation of collective goods is that of Bradford (1970) who presents concepts of individual and aggregate bid curves for valuation of public/collective goods. The individual curves reflect trade-offs between increments of the good and reduced quantities of a numeraire such as money income. Thus, these individual bid curves are nothing more than indifference curves passing through a given initial state. The aggregate bid curve is derived by vertically summing the individual bids over the relevant population. This summation of bids measures the benefits associated with the availability of various quantities of the public good. The optimal quan-

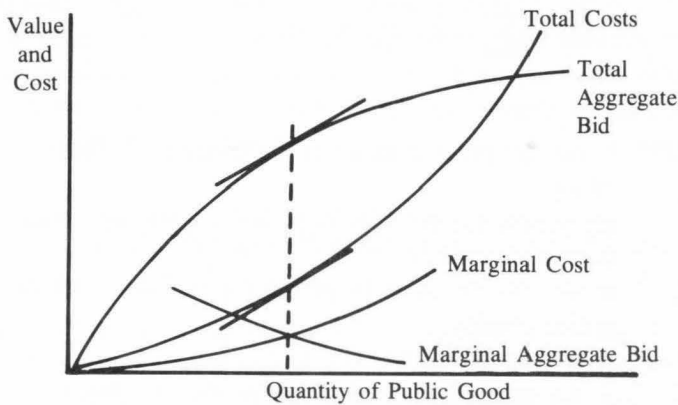


Figure 1. Collective optimization of the quantity of public good provided. Adapted from Randall, et al. 1974, Figure 1, p. 133.

tity of the public good is that amount associated with maximum excess of aggregate bid over total cost of provision (fig. 1). Alternatively, the socially efficient amount of the collective good exists when the total amount bid and the supply costs are equal at the margin. Brookshire et al. (1980) have extended the Bradford model in their development of a general framework for the valuation of natural-resource service flows. This latter framework adopts Hicksian (Hicks 1943) concepts of consumer surplus in the measurement of benefits associated with all classes of goods including nonexclusive collective goods. Following Brookshire et al. (1980), let us consider an individual whose utility level ( $U$ ) depends on his/her endowment of the Hicksian 'all other goods' numeraire ( $Y$ ) and the availability of services produced by a collective good ( $Q$ ). We may summarize this relationship as

$$U = U(Q, Y) \tag{2}$$

For example, at the origin ( $Q^0, Y^0$ ) in Figure 2, the individual is at a level of welfare that defines his/her 'status quo' position. To the right of the origin, the level of provision of the service to the individual increases; to the left of the origin, it decreases. From the origin, a

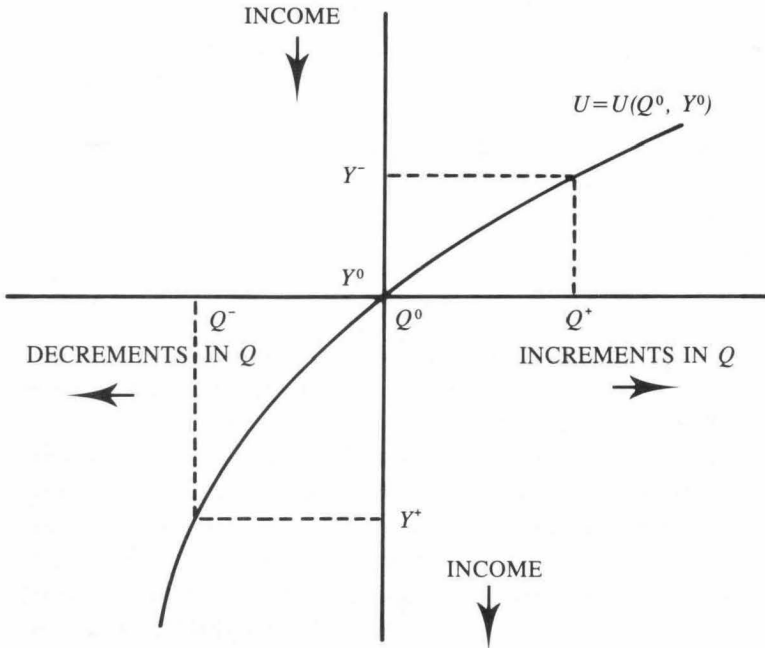


Figure 2. The total value curve for increments and decrements in the level of provision,  $Q$ , of a service for an individual who initially enjoys the level  $Q^0$  and the income  $Y^0$ . Adapted from Randall and Stoll 1980.

movement up the income axis indicates a decrease in income, while a movement down the axis indicates an increase in income. The total value, or bid, curve is of positive slope, given that the good is a utility-yielding commodity and the individual is not satiated in the range under consideration. For decreases in  $Q$  from the status quo position, the total value or indifference curve lies in the southwest quadrant; for increase in  $Q$ , it lies in the northeast quadrant. If it is possible to define the quantity of the good in unidimensional, cardinal terms, the assumption of diminishing marginal rates of commodity substitution is sufficient to ensure the curvature shown. If 'quantity' is multidimensional, or if it cannot be defined accurately in cardinal terms, no *a priori* assumption can be made concerning the curvature



of the total value curve (Bradford 1970). This may very well be the case in this study, where open space and environmental/historical amenities take on attributes more in the realm of qualitative rather than quantitative changes.

Recalling that, in the Bradford model, the individual's total value curve is an indifference curve passing through a given initial state, we can write

$$U(Q^0, Y^0) = U(Q^-, Y^+) = U(Q^+, Y^-) \quad (3)$$

where the plus and minus superscripts reflect increments and decrements of the commodity, respectively. If our individual's initial state is defined by the combination  $(Q^0, Y^0)$ , then the difference  $(Y^0 - Y^-)$  is the individual's maximum willingness to pay (*WTP*) for the increment  $(Q^+ - Q^0)$  of services from the collective good. Alternatively, in order to agree to the decrement  $(Q^0 - Q^-)$  in  $Q$ , our individual must receive compensation of at least  $(Y^+ - Y^0)$  of the numeraire. This latter amount is frequently referred to as the minimum willingness to accept (*WTA*) compensation. Employing *WTP* and *WTA* concepts we may restate equation (3) as:

$$U(Q^0, Y^0) = U(Q^+, Y^0 - WTP) = U(Q^-, Y^0 + WTA) \quad (4)$$

Implicit in the discussion above is the assumption that our individual has the right to his/her initial welfare position with the combination  $(Q^0, Y^0)$ . It then follows that, in order to gain an increment in  $Q$ , he/she must make a payment (of  $Y$ ). Likewise, if asked to reduce his/her consumption of  $Q$ , he/she is in a position to demand compensation. From this perspective, the *WTP* and *WTA* concepts are Hicksian (Hicks 1943) compensating measures of value for changes in  $Q$ . These measures are shown graphically in Figure 3.

It is useful, particularly in reference to the specific problem that is the topic of the study reported here, to consider an alternative view of the individual's rights. Suppose that our individual does not have legal claim to his/her initial position so that, in order to avoid a decrement in  $Q$ , he/she must be prepared to make a payment. Under this arrangement, the measure of value of the change (reduction) in the quantity of  $Q$  is the individual's *WTP* to avoid the change; this is

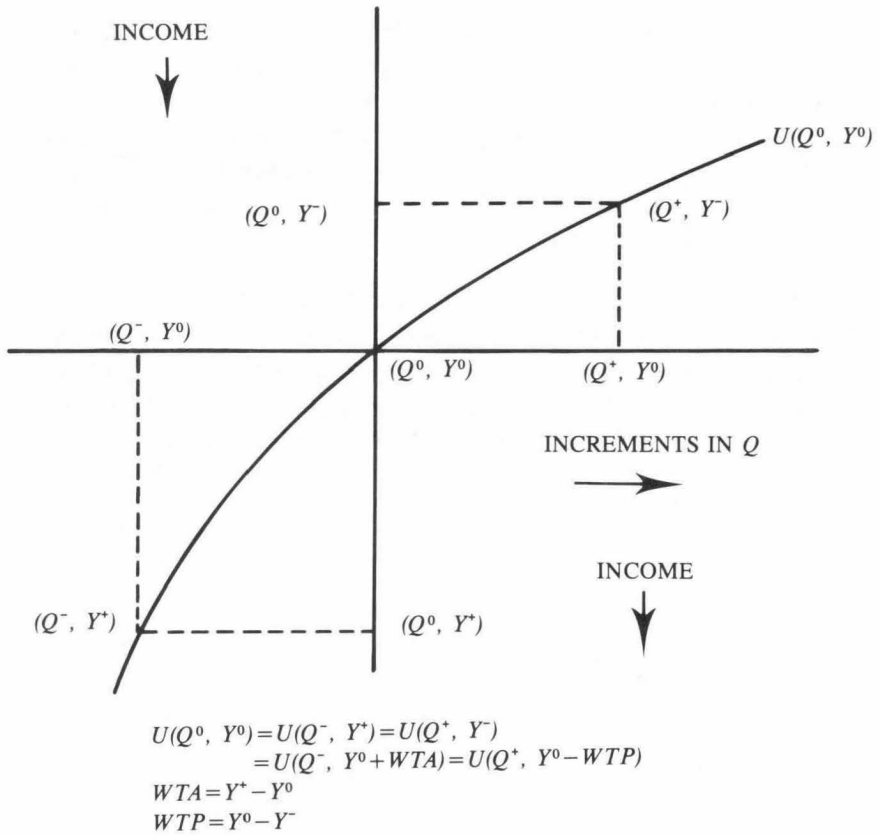


Figure 3. Hicksian compensating measures of value for changes in  $Q$ . Adapted from Randall and Stoll, 1980.

interpreted as a Hicksian equivalent measure of value. Likewise, in valuing an increment in  $Q$ , given this new perspective, we would be interested in the individual's  $WTA$  to forgo such a benefit. These relationships can be summarized as follows:

$$U(Q^0, Y^0) \geq U(Q^-, Y^0) = U(Q^0, Y^0 - WTP^E), \text{ for } WTP^E \geq 0 \quad (5)$$

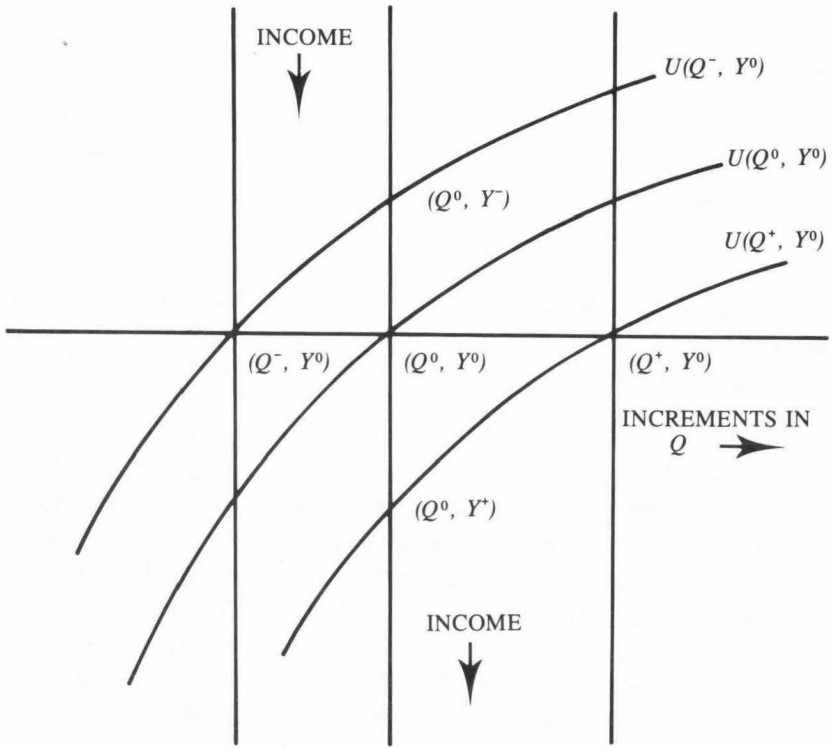
$$U(Q^0, Y^0) \leq U(Q^+, Y^0) = U(Q^0, Y^0 + WTA^E), \text{ for } WTA^E \geq 0 \quad (6)$$

where the superscript  $E$  refers to the Hicksian equivalent measures. These welfare changes are shown in Figure 4. In contrast to the concepts underlying equation (4) in which the individual's welfare is held constant by compensating changes in the numeraire as the level of  $Q$  is adjusted, in equations (5) and (6) we examine the adjustments in the numeraire that would have the equivalent effect on the individual's utility as would a change in the quantity of the collective good.

The expected relationship between  $WTP$  and  $WTA$  for a given change in a particular good has been examined in detail by Willig (1976) and by Randall and Stoll (1980). Except in those situations in which the change has a significant effect on the wealth of the affected parties, the difference between  $WTP$  and  $WTA$  measures is expected to be small.<sup>5</sup>

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<sup>5</sup>Results of recent experiments conducted by Knetsch et al. (1983) cast some doubt on this conclusion. Apparently, the intrinsic value that some consumers may place on ownership of a good can lead to  $WTA$  measures that greatly exceed theoretical expectations. With regard to the empirical divergence between the  $WTP$  and  $WTA$  compensation measures, this phenomenon should not influence the results of this study. Since property rights are assumed not to lie with survey respondents,  $WTP$  measures are employed. This eliminates the need to consider possible problems due to discrepancies between the two measures.



$$U(Q^0, Y^0) \geq U(Q^-, Y^0) = U(Q^0, Y^0 - WTP)$$

$$\text{For } (Y^0 - Y^-) = WTP \geq 0$$

$$U(Q^0, Y^0) \leq U(Q^+, Y^0) = U(Q^0, Y^0 + WTA)$$

$$\text{For } (Y^+ - Y^0) = WTA \geq 0$$

Figure 4. Hicksian equivalent measures of value for changes in  $Q$ . Adapted from Randall and Stoll, 1980.

# The Empirical Model

The objective of this study is to determine both the magnitude and the determinants of benefits stemming from open space and environmental/historical values of urban fringe farmland in Alaska. The structure of the empirical model to achieve this goal must satisfy the theoretical framework outlined in the previous chapter. In developing the empirical model, a perspective consistent with equation (5) was adopted. That is, the appropriate measure of value is the individual's *WTP* to avoid a decline in open space and environmental/historical amenities. Local residents of the Matanuska-Susitna Borough currently have little or no control over loss of these benefits. As local farmland continues to be subdivided for housing/commercial purposes, there are significant changes in the nature of the local surroundings. Since property rights, i.e., the right to decide whether or not to subdivide farmland, are vested with a few local farmers, the value of open space amenities accruing to other individuals are appropriately viewed as a measure of willingness to pay. As such, these benefits are interpreted as Hicksian equivalent surpluses.

Following the work of a similar study on farmland preservation in central Massachusetts (Foster et al. 1982), two levels of housing development on local farmlands were hypothesized and depicted to survey respondents in sets of color photographs. The empirical model was designed to account for variations in an individual's willingness to pay to avoid such changes. The general form of the cross-sectional model is:

$$WTP_j = f(LOC, HEAD, KOP, SEX, LOR, LED, AGE, INC, LDEV) \quad (7)$$

where:

$WTP_j$  = annual willingness to pay by the  $j$ th household for the prevention of a given level of residential/commercial housing development on specified agricultural lands. (It is assumed in this study that a respondent is able to determine the willingness to pay of all household members.)

$LOC$  = 0-1 dummy variable identifying the respondent's community of residence (1 = Wasilla area, 0 = Palmer area.)

$HEAD$  = 0-1 dummy variable identifying a head of household respondent (1 = head of household, 0 = nonhead of household.)

$KOP$  = 0-1 dummy variable identifying respondents having previous knowledge of proposed governmental programs to purchase development rights on agricultural lands (1 = previous knowledge, 0 = no previous knowledge.)

$SEX$  = 0-1 dummy variable to indicate sex of respondent (0 = female, 1 = male.)

$LOR$  = respondent's years of residence in the study area.

$LED$  = respondent's years of formal education.

$AGE$  = respondent's age in years.

$INC$  = respondent's annual household income in 1000 dollars.

$LDEV$  = 0-1 dummy variable indicating hypothesized level of housing development on local farmlands [0 = the hypothesized change depicted by photograph set B (low development situation) from photograph set A (no development situation), 1 = the hypothesized change depicted by photographic set C (high development situation) from photographic set A].

This study utilized ordinary least squares (*OLS*) regression with the intent of explaining the variation in the bids through the independent variables. While some of the variables in this model were in-

cluded on the grounds of theoretical expectations e.g., level of housing development (*LDEV*) and household income (*INC*), there are no strong *a priori* expectations regarding the effect that the remaining socioeconomic variables (*S/E*) might have on *WTP*. The choice of particular socioeconomic variables was based on previous *CVM* studies in which such factors have proven useful for explaining variation in an individual's valuations (e.g., see Foster et al. 1982, Desvousges et al. 1983, Daubert and Young 1981).<sup>6</sup>

As already mentioned, *LDEV* is a variable representing hypothesized changes in the level of housing development occurring on local farmlands in the areas in question. As such, *LDEV* is inversely related to the collective good (*Q*) in equation (5). That is, the more heavily the posited development of local farmlands, the less open space and environmental/historical amenities remaining on the specified farmlands. Again, assuming that the amenities (*Q*) are utility-yielding commodities and the individual is not satiated in the range under consideration, it is expected that *WTP* to avoid loss of such benefits will be an increasing function of the level of housing development on local farmlands, i.e., *LDEV*.

If the collective good could be described in continuous, unidimensional, and cardinal terms, this relationship could be expressed mathematically as  $\partial WTP / \partial LDEV > 0$ , and diminishing marginal rates of commodity substitution between the numeraire and *LDEV* would ensure  $\partial^2 WTP / \partial LDEV^2 < 0$ , i.e., a downward-sloping, marginal *WTP* function. However, as mentioned in the last section, in the case of a multidimensional commodity such as open space and

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<sup>6</sup>Interestingly, researchers in the field of landscape planning have also found background variables significant. Socioeconomic factors as sex, age, education, length of residence explain as much as 49 per cent of the variance in studies measuring scenic valuations (e.g., see Zube et al. 1974, Sonnenfeld 1966). It makes intuitive sense that the *S/E* variables may be important in determining the shape of the indifference map, therefore the *WTP* or bid function. The general theoretical model, equation (2), developed in the last section, however, incorporates only *Y* and *Q*. Therefore, it is of little help in understanding the relationships between *S/E* variables and the valuations expressed by respondents. Instead, this part of the study must be considered exploratory in its attempt to evaluate whether bids are systematic or random.

environmental/historical amenities, nothing can be said *a priori* about the expected curvature of the *WTP* or bid function. Although the *WTP* function remains an increasing function of *LDEV* (i.e.,  $\partial WTP/\partial LDEV > 0$ ), the marginal *WTP* or bid function may be upward, horizontal, or downward sloping (i.e.,  $\partial^2 WTP/\partial LDEV^2 \cong 0$ ), e.g., see Daubert and Young (1981).

Given the multidimensional and noncontinuous nature of the amenities in this study, it seems more reasonable to approach such qualitative changes by the use of a discrete dummy variable. Therefore, as individual respondents are shown increasing levels of housing development on local farmlands, it is expected that *WTP* to avoid such changes will increase, i.e.,  $\Delta WTP/\Delta LDEV > 0$ .

Following consumer demand theory, changes in an individual's income is expected to have the same systematic effect on *WTP* depending on the nature of the good in question. In this study it is hypothesized that open space and environmental/historical amenities are normal goods; therefore, it is expected that respondents with higher levels of income will display a measurable tendency to bid more than those with lower incomes, *ceteris paribus*. Mathematically, this can be expressed as  $\partial WTP/\partial INC > 0$ .



## Survey Procedure

A bidding game contingent valuation technique was employed in collecting data on an individual's willingness to pay for open space and environmental/historical amenities in the Matanuska-Susitna Valley of southcentral Alaska. *CVM* was considered a more flexible tool for this study since there are a number of problematic constraints imposed by the use of other nonmarket valuation methodologies. Bidding games are a direct approach to estimating Bradford's (1970) aggregate bid curve and, furthermore, can be used to address potential future situations involving environmental changes. This latter advantage of *CVM* is particularly relevant to the present study.

## Questionnaire Design

The questionnaire design followed that of Randall et al. (1974) in its attempt to present a credible hypothetical situation to respondents. The first part of the instrument consisted of a short text explaining the purpose of the survey and an introduction to the general topic of shifting land uses at the urban fringe (see Appendix). This was followed by some factual information including maps relating to quantity, locations and other characteristics of farmland in the local area. This was considered especially important so that the individual bids or valuations asked for later in the interview would be specific to the local situation and not refer to some general state or national trend in agricultural land conversion. Since the specified farmlands were well dispersed throughout the geographic areas in which the respondents reside, these residents were acquainted with the mentioned areas and seemed to have little difficulty conceptualizing the farmland to which their valuations were addressed.

The next part of the interview process presented the interviewee with a series of color photographs depicting potential levels of housing development for existing agricultural lands in the local area (see Appendix). Photographs associated with Scenario A represented the status quo or no development for the land remaining in the Old Colony and Homestead farms in the Palmer and Wasilla areas. Scenario B depicted moderate levels of housing development in photographs showing a landscape with a mixture of housing and farmland. Finally, Scenario C showed a landscape dominated by housing development with no farmland visible in the photographs.

Using Situation A as a reference point in each bidding game, the respondent was asked a series of questions designed to reveal his/her maximum willingness to pay annually to prevent the development scenario first in Situation B (i.e., *WTP B-A*), and then in Situation C (i.e., *WTP C-A*) for the remaining farmland acreage in the Old Colony and Homestead areas.

In order to lend credibility to these hypothetical valuations, some tangible method of payment had to be used in the survey administration. Respondents were given a choice of three payment vehicles: 1) an increase in local sales tax, 2) an increase in property taxes, or 3) a voluntary contribution to a special local farmland preservation fund. By allowing respondents the freedom to choose among payment methods, it was presumed that there would be less likelihood of a refusal to bid due to an aversion to a particular mode of payment. Since many Alaskans seem to harbor strong anti-big government sentiments, the option of a nontaxation mode of payment was deemed particularly appropriate for this study.

The interviewer started the bids at \$25 per year and asked respondents whether their household would be willing to pay that amount to prevent the development scenario under consideration. A yes response resulted in the bid's being raised by \$25 increments until the interviewee answered "no." At this point the amount was lowered in increments of \$5 until, again, a "yes" resulted. This final amount was interpreted as *WTP*.

Some of the respondents indicated that they would pay nothing to prevent one or both development scenarios from occurring. Researchers in previous bidding game studies have queried such respondents with follow-up questions to ascertain the motivation for such responses

(e.g., see Randall et al. 1974, Brookshire et al. 1976, Desvousges et al. 1983). For those respondents indicating that the amenities have no value, the response is typically recorded as a true zero bid. However, for those interviewees objecting to, say, the method of payment or to the idea of having to pay for amenities that they believe are already rightfully theirs, the typical procedure is to label such responses as 'protest' bids and to omit these data from the analysis.

Similar procedures were adopted for this study. However, the criteria for identification of protest bids were expanded to account for sentiments unique to the Alaskan situation. For example, when respondents in this study were asked to explain their motivations in refusing to bid, three basic answers were prevalent: 1) annoyance with governmental intervention in private land markets; 2) annoyance with increased taxation; 3) annoyance with the equity implications of governmental programs that benefit selected groups of local residents, i.e., farmland owners. Adopting such expanded criteria for this study, approximately 20 per cent of the sample were categorized as protest bids and eliminated from the analysis.

## FIELD APPLICATION OF SURVEY INSTRUMENT

The initial effort of this study focused on the benefits that accrue to individuals living in communities in close proximity to the specified agricultural lands. The reasoning behind this was twofold. 1) As previously mentioned, a successful application of *CVM*, i.e., where the potential pitfalls of hypothetical valuation are avoided, requires fulfillment of the Randall et al. (1974) criteria. In so doing, respondents should have a clear understanding of the nature of the collective good(s) in question. Intuitively, it makes sense that those individuals who have daily contact with these farmland-associated amenities would have a clearer understanding of the inherent value of these goods than would individuals with only occasional contact (for a similar discussion in reference to air quality in Los Angeles, see Brookshire et al. 1982). 2) It would be interesting to address the valuations of residents of more urbanized communities for these amenities, say, inhabitants of Anchorage and Fairbanks. However, these efforts would have contributed significantly to the time and expense of this study. Given the

budgeting constraints of this initial effort, this is left for future investigation.

Over a period of approximately four weeks during the summer of 1983, some 153 randomly selected households in the Palmer, Wasilla, and outlying areas of the Matanuska-Susitna Valley were surveyed. Given the relatively homogenous nature of the population characteristics within the region (Kruse <sup>7</sup>), a geographically stratified sampling plan was implemented based upon Matanuska-Susitna Borough census data (Matanuska-Susitna Borough Census 1983). Census information indicated the number of households within several geographic subregions, and we used this information to assign a representative percentage of the total number of interviews to each particular subregion. A random selection process was devised in order to ensure that each household within a subregion had an equal chance of being selected for an interview.

The interview was designed to be brief, (the average interview lasted only 15 minutes), and this brevity was indicated to the respondents before the initiation of the interview. In doing so it was expected that the boredom or fatigue factor—hence, a potential for bias—involved with many more time-consuming surveys would be reduced. Consequently, response rates were found to be quite high—95 per cent of those individuals who were at home agreed to be interviewed. Follow-up interviews were attempted in cases where initial contact failed.

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<sup>7</sup>Kruse, J. Professor, Survey Research, Institute of Social and Economic Research, Anchorage, AK. Personal communication. June, 1983.

## Results

The model relating  $WTP$  to casual factors, equation (7), was estimated by applying  $OLS$  techniques to 119 survey responses. Multicollinearity between some of the independent variables was detected by high correlation coefficients (i.e., between head of household and sex). As econometric theory suggests, eliminating one of these variables from the model improved the t-statistics without significant loss of explanatory power (Theil 1971).

Both linear and semi-log formulations of the  $WTP$  function were estimated. The results of these regressions are presented in Table 1. F-tests were performed separately on each model specification to determine overall goodness of fit. Specifications of both models are statistically significant at the 1 per cent level. Given these results and the statistical significance achieved by most of the individual regressors, it appears that bids offered by survey respondents are systematically linked to the casual factors and are not merely random noise.

Individual regressor coefficients in the linear model are particularly useful for direct interpretation of the partial effects of the casual factors on the dependent variable ( $WTP$ ). Looking first at  $LDEV$ , we hypothesized that a respondent household's willingness to pay to preserve farmland-associated amenities is directly related to the severity of the amenity loss.  $LDEV$  is statistically significant in both models at the 1 per cent level (table 1). Additionally, the linear model predicts that a household would be willing to pay \$70.75 more per year to prevent the high-development scenario ( $WTP_{C-A}$ ) than it would expend for prevention of the moderate-development scenario ( $WTP_{B-A}$ ), *ceteris paribus*. By comparison,  $WTP_{B-A}$  values ranged from zero to \$760 with a mean of \$62 per household annually. Bids to avoid conditions associated with development scenario C ( $WTP_{C-A}$ ), varied from zero to \$1000 with an average of \$119.

**Table 1. Regression results for linear and semi-logarithmic functions.<sup>1</sup>**

Dependent Variable	Equation	
	Linear Form	Semi-Log Form
	WTP	ln (WTP)
Constant Term	78.72 (1.30) <sup>2</sup>	2.686 (3.91) <sup>4</sup>
LOC	-40.63 (-1.49) <sup>2</sup>	-.4617 (-1.50) <sup>2</sup>
HEAD	63.74 (2.40) <sup>4</sup>	.4161 (1.38)
KOP	92.94 (3.07) <sup>4</sup>	.6618 (1.93) <sup>3</sup>
SEX	excluded	excluded
LOR	excluded	excluded
LED	excluded	excluded
AGE	-1.987 (-1.90) <sup>3</sup>	-.00036 (-0.31)
INC	.7328 (1.00)	.0029 (0.35)
LDEV	70.75 (2.74) <sup>4</sup>	1.7124 (5.86) <sup>4</sup>
R-Square	.213	.297
n	119	119
F-Statistic	5.05	7.90

<sup>1</sup> t-ratios in parentheses

<sup>2</sup> t-ratio significant at .20

<sup>3</sup> t-ratio significant at .10

<sup>4</sup> t-ratio significant at .01

Following the theoretical considerations presented earlier, income was expected to weigh positively on *WTP* indicating that amenities in question were normal goods. Referring again to Table 1, we find that in both models the regression coefficients of the income variable are statistically insignificant. This indicates that the income variable has little or no systematic effect on the *WTP* of surveyed households.

Hence, open space and environmental/historical amenities in this study should be considered income-neutral goods.

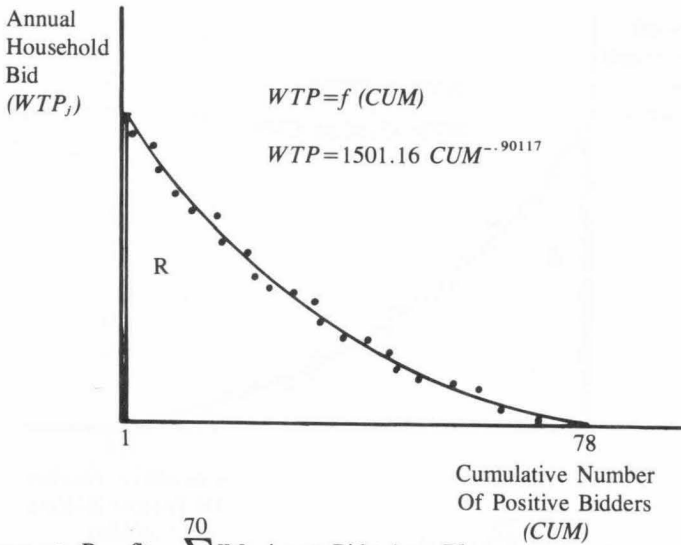
As mentioned earlier, with the exception of *LDEV* and *INC*, there were no strong *a priori* expectations regarding the signs of the regressors. The inclusion of the socioeconomic variables should be considered exploratory in nature. Referring to the linear model in Table 1, we see that head of household (*HEAD*) and previous knowledge of a development rights purchase program (*KOP*) are both statistically significant at the 1 per cent level. Recalling that these variables are 0-1 dummies, head-of-household status (*vis-à-vis* a non-head) and previous knowledge of development rights purchase program (*vis-à-vis* lack of knowledge) will increase the household's predicted *WTP* by \$63.74 and \$92.94, respectively. Interestingly, *KOP*—i.e., some previous knowledge of state and/or local efforts to slow agricultural land conversion—was the most powerful variable (followed by *LDEV*) as shown by an analysis of variance.

Again, focusing on the results of the linear model, we see that residential location (*LOC*) and age of respondent (*AGE*) are statistically significant at the 20 per cent and 10 per cent levels, respectively. *LOC* is a 0-1 dummy variable, and those households located in areas contiguous to the city of Wasilla are predicted to be willing to pay \$40.63 less than those households located in the Palmer areas, *ceteris paribus*. This makes intuitive sense since more of the large, scenically appealing farms are located in the Palmer area. Finally, the age of respondents and household's *WTP* are found to be inversely related. The linear regression coefficient predicts for every five-year increment in age of a respondent, the household's *WTP* for farmland amenities decreases by \$1.99. Explanations of this phenomena must be viewed as purely speculative. Perhaps older individuals anticipate a shorter stream of lifetime benefits accruing from farmland preservation efforts. Hence, a rational consumer would pay no more for the amenities than the value of what he/she expected to consume.

Several variables were excluded from the final model specification. As mentioned previously, *SEX* was eliminated due to multicollinearity with head of household (*HEAD*). Length of residence (*LOR*) and level of education (*LED*) were eliminated due to their nonessential role in the theoretical model and the insignificance of the resulting t-ratios.

# ESTIMATION OF AGGREGATE BENEFITS OF FARMLAND-ASSOCIATED AMENITIES

Given the sampling procedure, the results of this study can be viewed as representative of the types of valuation expected from Matanuska-Susitna Borough residents in general. Estimation of the annual amenity benefits accruing to borough residents from the retention of the designated farmlands in agriculture were obtained by aggregating the individual bids in the sample and extrapolating these results to the area population. This estimation procedure is facilitated by use of cumulative demand curves (Martin et al. 1980), one of which has been calculated for each bidding scenario, i.e.,  $WTP_{C-A}$  (figure 5)



$$\begin{aligned}
 \text{Aggregate Benefits} &= \sum_{1}^{70} [\text{Maximum Bid} + \text{Area R}] \\
 &= \sum_{1}^{70} [760 + \{WTP \text{ d } CUM\}] \\
 &= \sum_{1}^{70} [8933] = \$625,586
 \end{aligned}$$

Figure 5. Estimation of Aggregate Benefits  $WTP_{B-A}$



and  $WTP_{B-A}$  figure 6). A cumulative demand curve is useful for addressing consumer surplus issues when valuations are based on 'all-or-nothing' provisions of a particular good. Such is the case in this study. The demand curve is formed by successively lowering annual household  $WTP$  to determine the number of bidders who would be willing to pay at least that particular value for the amenity provision. For each bidding scenario, benefits to sample respondents is the integral of the respective cumulative demand curve for that particular situation. Since this study's sample is approximately one-seventieth of the total number of borough households, we can extrapolate the sample results to derive aggregate benefits to the population as a whole.

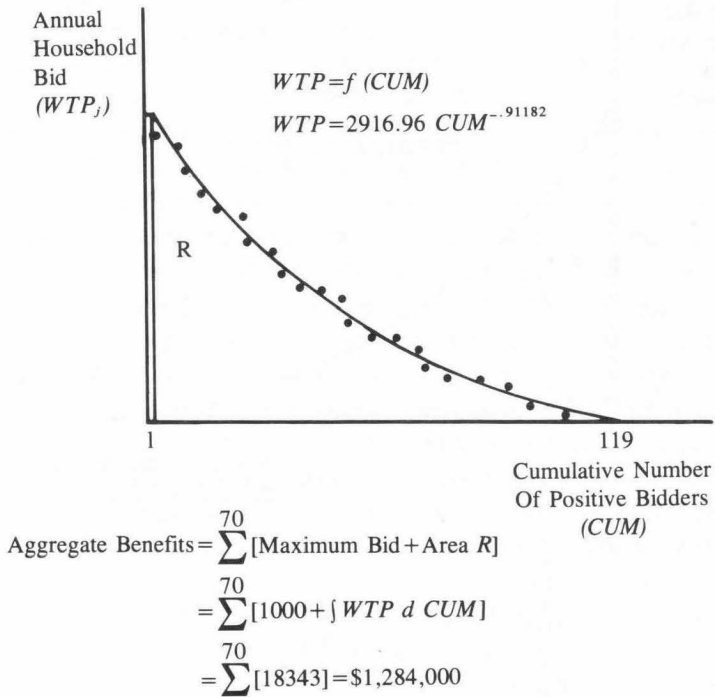


Figure 6. Estimation of Aggregate Benefits  $WTP_{C-A}$

Figures 5 and 6 show these calculations, the results of which were \$625,586 per year and \$1.284 million per year, respectively, for aggregate  $WTP_{B-A}$  and  $WTP_{C-A}$ .

## Discussion and Conclusion

Previous work by Workman et al. (1979) estimated the potential cost of a state-sponsored program for purchase of development rights on Alaska's agricultural lands. The estimated cost, in 1978 prices, of purchasing these rights on farmlands located in roughly the same area as that addressed in the current study was \$15.165 million. Indexed to reflect current price levels, this figure would now be approximately \$20.25 million. In addition, the earlier study estimated that such a program would involve administrative costs of \$80,000 annually.

Combining the results of the current study and Workman et al. (1979), one can evaluate the net benefits of an effort to retain the amenities associated with the Old Colony and Homestead farmlands. Only the benefit estimates associated with avoiding development Scenario C (high development) need be considered since a program that would prevent Scenario B would also prevent Scenario C. Given that the strongest sentiments (as reflected by mean bid) were in response to Scenario C, these benefits should be used in conjunction with the program costs.

Treating the aggregate bid estimates (less administrative costs) as a measure of annual benefits that would flow in perpetuity, the net present value (*NPV*) of the development rights purchase investment can be calculated for various discount rates. These results are presented in Table 2. These *NPVs* range from \$100.02 million at 1 per cent discount rate to \$-.183 million calculated at 6 per cent discount rate. Net present value per acre is shown in the second row of this table. The internal rate of return (that discount rate that results in an *NPV* equal to zero) was calculated to be 5.94 per cent. It is not uncommon for public agencies to use discount rates ranging from 4 to 7 per cent. Within this range, positive *NPVs* are obtained. In addition, real rates of return on the Alaska Permanent Fund investments

**Table 2. Net present value of open space retention.**

Value	Discount Rate (%)					
	1	2	3	4	5	6
Net Present Value (\$ million)	100.2	39.95	19.88	9.85	3.83	-.183
Net Present Value per farmland acre (\$)	14305	5705	2738	1405	545	-29

from 1982 to 1984 have ranged from 4.73 to 7.67 per cent (Alaska Permanent Fund Corp. 1984). Hence, the internal rate of return in this study is comparable within this time frame.

This study should be viewed as an initial effort to value nonmarket amenities associated with farming activities and, hence, several caveats and suggested directions for further inquiry can be offered. First, it is recognized that individuals other than local area residents may benefit from the retention of these amenities. Since both in-state and out-of-state tourists spend time and money to travel through this historic and scenic agricultural area, future studies could employ travel cost and/or *CVM* techniques to assess these additional potential benefits. Second, there may be option and/or existence values associated with farmland retention. Option values are those benefits derived from the knowledge of potential future availability of a resource (Weisbrod 1967). Existence values, on the other hand, provide satisfaction based not on actual or potential use, but solely on knowledge of the continued preservation of a unique resource (e.g., see Schulze et al. 1983 and Brookshire et al. 1983). Given these additional potential benefits, this study's results may be a lower boundary.

Conversely, it is not unreasonable to suspect that the estimates are biased upward by people overstating their true willingness to pay in this contingent market setting. If we assume that the benefits of a development rights purchase program are concentrated locally within the borough, knowledge that the costs of such an endeavor would be spread over all state residents would be an incentive to overstate one's true preference in order to increase the likelihood of the investment's being undertaken. Future studies could circumvent this problem by

limiting the payment vehicles to those specific to the local beneficiaries (e.g., property tax increases). However, as mentioned earlier in this study, adherence to a particular method of payment (vis-à-vis giving the respondent the option of various vehicles) may lead to payment vehicle bias. The existence of this bias can be tested, (e.g., see Rowe et al. 1980 and Thayer 1981), therefore, future studies should address this problem.

Another issue of interest to public decision makers is that of distributional impacts. Individuals with higher incomes may express a higher *WTP* for a particular publicly provided good than those with lower incomes. Given this discrepancy, governmental projects based solely on *WTP* may generate projects which provide disproportionately greater benefits for higher income groups (Dwyer et al. 1977). In this study, distributional issues appear to be relatively unimportant. As was discussed earlier, income was an nonsignificant regressor on *WTP*, hence, there appears to be no tendency for wealthier individuals to influence the aggregate benefits more than those who are less wealthy. Furthermore, based on the results of the random sample, it is evident that support for retention of farmland-associated amenities is widespread in the borough. Since 80 per cent of the same respondents were nonzero bidders, approximately four-fifths of the local population can be expected to be willing to pay to prevent loss of such amenities.

A final issue that merits attention concerns the all-or-none valuations in this study. Given the nature of the resource in question and practical limitations imposed by the survey design, marginal valuation was considered impracticable. This *CVM* study design was limited to three levels of residential housing development on farmlands (i.e., Scenarios A, B, and C). In each posited change (i.e.,  $WTP_{C-A}$ ,  $WTP_{B-A}$ ) bids were based on the retention of the entire remaining Old Colony and Homestead area as farmland. Hence, the resulting investment analysis is an "all-or-nothing" case. Unlike other *CVM* studies where the resource was such that provision is smoothly continuous and of a homogeneous nature, e.g., cubic feet of stream flow (Daubert and Young 1981) or miles of visibility (Schulze et al. 1983), these farmland-associated amenities are lumpy, heterogeneous, and site specific. This inherent characteristic of the nonmarket good makes straightforward marginal analysis more cumbersome in a hypothetical context.

One method that might be used to deal with the nonhomogeneous problem and to incorporate incremental valuations would be a "strategically" located, site-specific bidding-game design. With this approach, farmland units of relatively homogeneous scenic and environmental/historic quality would first be identified by the researcher. Respondents could then bid incrementally on progressively larger acreage bundles providing the farmland-associated amenities. Future efforts in this area should, perhaps, use this approach. In this study, however, the site specific approach was deemed infeasible. Increased site specificity would have added considerably to the introductory background information required to conduct the bidding games. As a result, the time required to conduct a household interview would have increased substantially. Since the "boredom factor" (e.g., see Schulze et al. 1981) was an important consideration in development of the survey design, tedious descriptions of a number of specified farmland parcels could have led to biases and/or increased interview rejection rates. Given these interview related problems, the "all-or-nothing" analysis was considered the most feasible approach, particularly for this initial effort.

To conclude, the objectives of this study were twofold: 1) to apply *CVM* to a timely problem concerning an Alaskan agricultural lands and in doing so address the determinants of consumers' valuation; and, 2) to fill a public policy information gap concerning the social value of public actions aimed at retaining Old Colony and Homestead farmlands. First, several causal factors were shown to be influential in determining an individual's annual *WTP* for farmland-associated amenities. Severity of the loss of such amenities and knowledge of public efforts to retain local farmlands (*vis-à-vis* lack of such knowledge) were positive influences on *WTP*. On the other hand, an increase in a respondent's age and/or residence in the Wasilla area (*vis-à-vis* Palmer area) weigh negatively on *WTP*.

Secondly, within the range of discount rates commonly used in public projects there would be sizeable net benefits accruing to borough residents from efforts to retain Old Colony and Homestead farmland. While efforts to retain these farmlands appear to be justifiable on grounds of economic feasibility, no assertions can be made, however, as to whether or not this is the best use of state monies. Conceivably, several public projects of comparable cost structures could prove

economically efficient (i.e., *NPVs* are greater than 0), however, the most efficient use of public lands, *ceteris paribus*, would be the project with the highest *NPV*. Comparisons of interproject net valuations are left to Alaska's public decision-makers.

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# Appendix

## QUESTIONNAIRE

LOCATION: \_\_\_\_\_

TIME/DATE: \_\_\_\_\_

H.H. MEMBER: \_\_\_\_\_

INTERVIEWER: \_\_\_\_\_

(At the door)

Hello, my name is \_\_\_\_\_. I'm from the Department of Economics at the University of Alaska, and I'm conducting a survey on land use in the Palmer/Wasilla area. Could I take a few minutes of your time to ask you some questions?

(Inside)

Before I begin the questionnaire, let me give you a little background information on what we're doing. I'm part of a team from the university that is looking at land use issues in this area. This study is being funded by the State of Alaska. The survey is designed to look at some of the trade-offs between housing development, farming, and open space in the Palmer-Wasilla area. If you don't mind I'd like to ask you a few questions about your feelings on this subject. The answers you give are very important to this study and could help the state and local officials determine the type of surroundings that local residents would like to have. The survey takes about 20 minutes to do. Let me assure you that your answers will be held strictly confidential, and your name will not be associated with any of your responses. Are you ready to begin?

If something is not clear or you have any questions, please feel free to stop me at any time.

Over the last several years a number of working farms in the Matanuska-Susitna Valley have been sold for housing development. Some people see this trend positively in that it has provided needed housing and economic growth using land that is already cleared and relatively easy to develop. Other people are in favor of local housing development, but would rather not see it occur on farmland. Finally, some people are opposed to all local housing development and would like to see things stay the way they are.

1) Which of the following best describes your feelings about this trend?

Are you . . .

Question 1

a) in favor of housing development on local farmland?

a) \_\_\_\_\_

b) in favor of housing development but not on local farmland?

b) \_\_\_\_\_

c) opposed to local housing development in general?

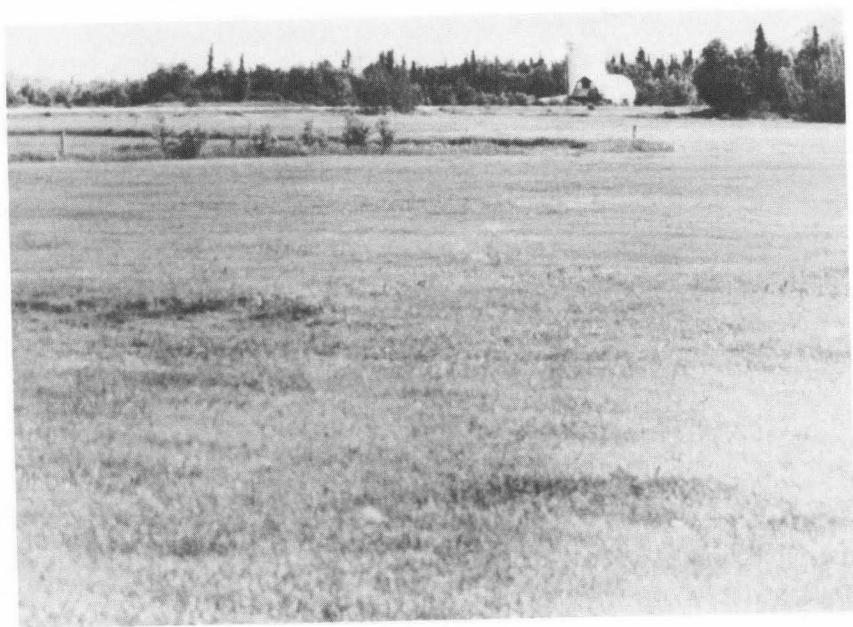
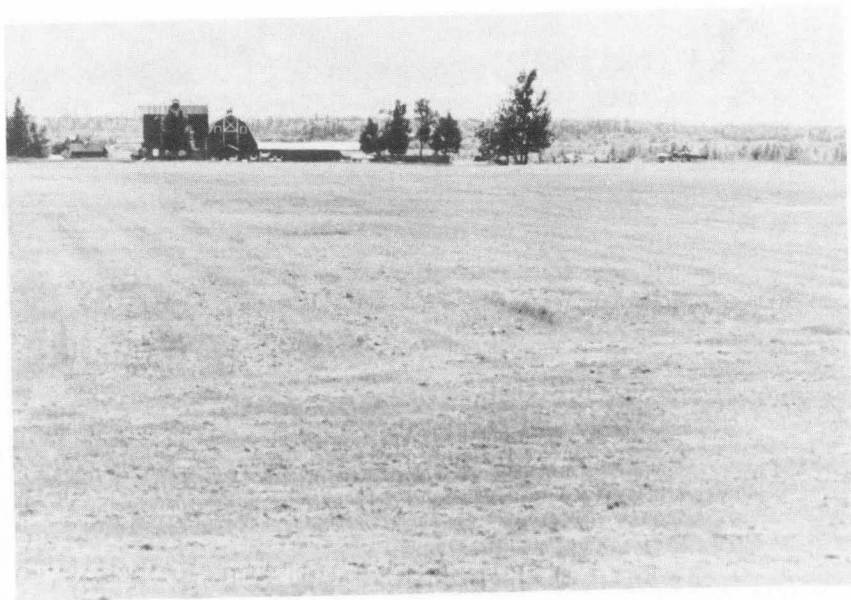
c) \_\_\_\_\_

Much of this development activity has occurred in the Old Colony and Homestead areas. (Show map.) These areas are highlighted on the map. They include the Fairview Loop area, the Lazy Mountain area, the Palmer and Springer Loop area, and the Bodenberg Butte area. Within these areas, there are about 10,000 acres of farmland under cultivation. Not only are these the most productive farms in the borough, but they also have historical and tourism significance.

If housing development continues on local farmland, it could have a noticeable impact on the present open and rural nature of the valley. These photographs (show pictures) are designed to show typical types of development activity that could occur on the remaining farms in the Old Colony and Homestead areas.

Situation A shows operating farms upon which there is no housing development. Note the open space and the absence of residential housing. This is meant to represent the current condition of the remaining Old Colony and Homestead farmland.

Situation B shows moderate levels of development where farming and residential housing are intermingled. Residential housing is now present on what previously was strictly farmland.



*Situation A*



*Situation B*



*Situation C*



Finally, Situation C represents the maximum density of housing development where farming is absent. Notice there is very little open space and residential housing now dominates the landscape.

The next part of the survey is designed to determine whether or not you place value on preserving farmland in the Old Colony and Homestead areas.

Usually people do not place dollar values on scenery, open space, or their surrounding environment, but such things are valuable to some people. Since it would cost money to keep farmland in its current state, I'd like to determine whether or not a rural farm environment is worth something to you in dollar terms. Consider, if you would, the possibility of residential housing development, such as Situations B and C (point to photographs), occurring on all of the remaining Old Colony and Homestead farmland.

Suppose the State and the Matanuska-Susitna Borough supported a program to preserve some of this local farmland. Farmers would be fully compensated for any loss of development opportunities and their participation would be strictly voluntary. Let's say two-thirds or approximately 7,000 acres could be preserved under this arrangement.

There are basically three ways to fund such a program and to keep this land from being subdivided and developed. The first method would be an additional sales tax to be collected from all residents of the state. The second method would be an increase in property tax for all resident homeowners. Assume this tax would be passed on to anyone renting a dwelling also. The third method, a special fund, would be supported by private donations.

Now if you will again focus upon the photographs showing the different levels of development. I would like to address the question of whether or not your household would be willing to pay to avoid the increased levels of development shown in Situations B and C. When you are deciding whether you are willing to pay, you will always be comparing a particular development level with the least-developed situation—Situation A.

Again, Situation A is meant to show the operating farms that lie within the Old Colony and Homestead area. Situations B and C are possible future residential housing development that could occur on these same farms.

(Cover Situation C)

- 2) Now compare Situations A and B (show photographs). Would your household be willing to pay in order to prevent the increased level of development in Situation B? Would you be willing to pay \$25 per year to prevent Situation B from occurring? How about \$50 per year? (Increment by \$25 per year until a negative response, then decrease by \$5 until a positive response; record amount.)

Question 2  
\$ \_\_\_\_\_

(Cover Situation B)

- 3) Now look at Situation C. Would your household be willing to pay to prevent Situation C from occurring? Would you be willing to pay \$25 per year? (Repeat bidding process.)

Question 3  
\$ \_\_\_\_\_  
(If 'zero,' go to 3A)

(If zero bid in Question 3, then ask Question 3A; otherwise skip to Question 4.)

- 3A) We have found in studies like this that people have a lot of reasons for answering the way they did. Which of the following reasons best describe why you bid "zero"? You . . .

Question 3A  
\$ \_\_\_\_\_

- a) didn't have enough information
- b) don't believe you can put a dollar value on your surroundings
- c) object to all the methods of payment mentioned. (Go to 3B.)
- d) don't place value on preserving farmland
- e) or is there some other reason you can think of?

3B) (If respondent chose 3Ac).

Can you think of a method you would support?

If yes, repeat bidding game Question 2) and 3).

4) Have you heard about the proposed legislation to buy development rights in this area?

Question 4

a) yes

a) \_\_\_\_\_

b) no

b) \_\_\_\_\_

I have just a few more questions I'd like to ask you. Again, all your answers will be held strictly confidential.

Question 5

5) Sex:

M \_\_\_\_\_ F \_\_\_\_\_

6) How long have you lived in the Matanuska-Susitna borough?

Question 6

\_\_\_\_\_ years

7) What is your occupation?

(follow-up) Is your occupation related to agriculture?

8) Are you the primary income earner in the family?

Yes \_\_\_\_\_ No \_\_\_\_\_

Here is a list of education, age and income categories. (Hand respondent card.)

9) Please call off the code letter that corresponds to your level of education?

Question 9

\_\_\_\_\_

10) Now the letter that corresponds to your age group?

Question 10

\_\_\_\_\_

11) And now the letter for your household income.

Question 11

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(If respondent is reluctant: I understand your reluctance about giving this type of information, but let me reassure that there are no names associated with *any* of the surveys. Also, unless we have some idea of household income, we will be unable to use your responses in the study.)

THANK YOU FOR PARTICIPATING IN THIS STUDY.

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