



Land use taxation policy and agricultural land use
by Gary Thomas Pryputniewicz

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Abstract:

Many people feel there are imperfections in the land market that result in a sub-optimal allocation of land to its various uses. Legislators seek to remedy this situation with assorted tax policies that may alter land use decisions. The Montana Legislature has passed an act known as the Montana Economic Land Development Act (MELDA) to influence land use in Montana. This paper evaluates MELDA from an economic viewpoint.

A spatial model of the land conversion process for agricultural land is developed. The imperfections and external costs that cause a socially sub-optimal allocation are identified, and the economically correct tax policy to mitigate the imperfections and internalize the external costs is presented. Comparing the policies of MELDA to the economically indicated policies, MELDA is found to be a deficient act likely to result in even greater inefficiency than the free market allocation. A policy alternative containing the proper elements to achieve the social welfare-maximizing allocation is then presented.

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AGRICULTURAL LAND USE

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Gary Thomas Pryputniewicz

A thesis submitted in partial fulfillment
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of

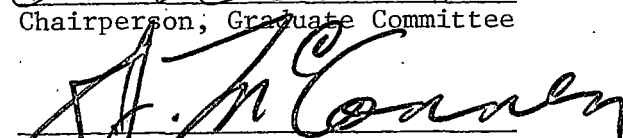
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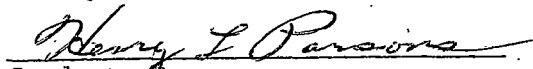
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ABSTRACT

Many people feel there are imperfections in the land market that result in a sub-optimal allocation of land to its various uses. Legislators seek to remedy this situation with assorted tax policies that may alter land use decisions. The Montana Legislature has passed an act known as the Montana Economic Land Development Act (MELDA) to influence land use in Montana. This paper evaluates MELDA from an economic viewpoint.

A spatial model of the land conversion process for agricultural land is developed. The imperfections and external costs that cause a socially sub-optimal allocation are identified, and the economically correct tax policy to mitigate the imperfections and internalize the external costs is presented. Comparing the policies of MELDA to the economically indicated policies, MELDA is found to be a deficient act likely to result in even greater inefficiency than the free market allocation. A policy alternative containing the proper elements to achieve the social welfare-maximizing allocation is then presented.

CHAPTER I

INTRODUCTION

In 1975 the legislature of Montana enacted a law known as "The Montana Economic Land Development Act." This act was introduced in the forty-fourth legislative session as House Bill 672 and will hereafter be referred to as "MELDA" or "the act." The portions of the act that affect agricultural land are listed in the appendix. The purpose of this paper is to develop a spatial model of the land market, evaluate MELDA from an economic viewpoint, and propose an alternative policy to achieve the desired goals. The analysis will concentrate on the transition of land from agricultural to residential use.

The first goal, stated in Section 84-7503.1 of the act, is the preservation of prime agricultural land. Presently there is an adequate supply of agricultural land to meet our food needs; however, as population increases in the future the need for more food producing land will arise. The food could be produced on a given amount of productive agricultural land or a larger amount of less productive land. Apparently the legislators feel it is in the social interest to delay or prohibit the transition of prime agricultural land to residential use so future food production can be maximized for any given quantity of land available.

The second goal, stated in Section 84-7503.2 of the act, is to curb urban sprawl. The cost of providing services to scattered developments in the urban fringe area is greater than the cost of providing the same services to a more dense development pattern on the urban periphery. The additional costs are typically borne by all taxpayers and not just the benefactors. The legislators feel that curbing sprawl will alleviate the social burden associated with scattered development.

The second sentence of Section 84-7503 states that the goals will be achieved ". . . by reducing the need for zoning and other land control measures and placing our future development under a free market system controlled not by land regulation, but by economics." The economist will recognize this as internalizing externalities so the market system can correctly allocate our land resource for the maximum social benefit.

If the land market was perfectly competitive and free of externalities, Pareto optimal land use would be dictated by the market and social welfare would be maximized. The first goal, prime agricultural land preservation, would be irrelevant because all land under perfect competition must be homogeneous. The second goal, curbing urban sprawl, would be attained because land on the urban periphery would be converted to residential use before more distant land in order to minimize service costs.

While legislators cannot legislate a perfectly competitive land market, they might, with a system of tax incentives and penalties, force a rational landowner to consider the external benefits and costs associated with his actions. A penalty imposed for converting distant agricultural land to residential use may force the landowner to consider the external cost, represented by the penalty, imposed on society as a result of the conversion. This is clearly a case where an externality may be internalized and economic efficiency improved.

The case for prime agricultural land preservation is not so clear and this goal may not be appropriate universally. If prime agricultural land lies in the path of the most efficient development pattern, the benefits from converting to residential use may be greater than the benefit from retaining the land in agricultural production. In this situation, the socially optimal allocation is to develop the prime land. Application of the conversion penalties of MELDA would hinder the proper allocation.

The charge that there is a social external cost associated with not retaining prime agricultural land for future production is questionable. Every potential agricultural land owner perceives the future need for food. The social cost of not having a parcel of land for future food production is the same as the private cost of not having that parcel of land available for food production in the future. It seems unlikely that there are any external costs to hinder the

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efficient allocation of prime agricultural land.

The contradiction in the goals is evident. If prime agricultural land is to be preserved by developing the less productive land first, development will occur in the scattered areas of less productive land on the urban fringe. If sprawl is to be contained it may be necessary to develop prime agricultural land on the urban periphery.

PROVISIONS OF MELDA

The act requires the county government in each county to inventory the land in its jurisdiction and prepare a land use plan for the county. "Agricultural land" is one of the categories the county may designate in preparing the plan. After a series of public hearings, Department of Community Affairs approval, and Department of Revenue approval the plan may be implemented. This plan is the zoning provision of the act.

According to Section 84-7510, owners of land in agricultural zones must subclassify their land into designated categories. Various tax breaks, penalties, and restrictions are assigned to each subclassification. The inducements and penalties for converting agricultural land to residential use are contained in Sections 84-7512.2 and 84-7512.3. These subsidies and penalties are the zoning enforcement provisions of the act.

The goal of prime agricultural land preservation is to be achieved

by zoning areas for agricultural use and imposing penalties upon conversion to residential use. If a landowner in an agricultural zone elects to forfeit his conversion right for a specified time he may subclassify his land into the appropriate category and receive a tax reduction.

The goal of sprawl reduction is to be achieved by increasing the conversion penalty with increased distance from the city. The distances for penalty increases are defined by three rings around each city and a predetermined percentage increase in the tax penalty is associated with each ring.

CHAPTER II

THE MODEL

The presence of laws such as MELDA indicate that society does not feel the market correctly allocates our land resource to maximize social welfare. It was previously mentioned that in the absence of externalities a perfectly competitive market would achieve the desired goals of MELDA with respect to agricultural land conversion.

In the words of McMillan [6: 411]

The conversion of land from rural to urban uses is the product of many developers and landholders' decisions and, as such, it should offer the advantages of the atomistic market. Since the competitive structure is generally considered a prerequisite of an optimal market allocation, one might expect that the timing of development and the allocation of land among alternative uses would be appropriate. If the market functioned properly, land would be allocated among alternative uses in a welfare-maximizing way -- the optimal mix occurring when the marginal value of land in each alternative use is equal and local property values are maximized.

The externalities associated with land use may be internalized and the misallocation problem from that standpoint solved. The questions that arise are how does the land market differ from a perfectly competitive market and what are the implications regarding efficiency of land use under this divergence?

The land market obviously differs from the homogeneity requirement of perfect competition. All land is not the same in agricultural productive quality, nor does all land have the qualities valued for

residential use. Does the varied productive ability of agricultural land result in an inefficient allocation?

The productive value of a parcel of agricultural land is the present value of the stream of economic rent derived from the agricultural use of that land. The capitalized value of farmland is thus determined by its productivity in agricultural use [Quenemoen and Thompson, 9]. A parcel of land suitable for growing two commodities will be used for the production of the socially desired commodity as indicated by the relative prices of the commodities and the productivity of the land for each commodity. The socially desired allocation coincides with the private allocation. This implies that non-homogeneous land does not preclude an efficient allocation among the competing agricultural uses. Agricultural land will be employed in its highest and best agricultural use and the price of the land will vary with its relative productivity in that use.

The justification for MELDA is that the conversion of agricultural land to another use will not result in the selection of the highest and best use of land from a social standpoint. This view deserves further analysis.

Land on the urban fringe which sells at a price higher than its agricultural value is clearly demanded for some other use. The alternative use of concern here is residential use. Increased economic activity and growth in the urban area, along with the desires of urban

dwellers to be suburban dwellers, results in bidding the price of land in the urban fringe up. The price of land with favorable residential characteristics will be bid higher than the price of land with less favorable characteristics. Some of the characteristics affecting residential use are distance from the service center, view, slope, drainage, access to highways, and neighborhood attributes.

Dunn [3] in describing agricultural land use patterns defines ring formations of land use around the market center. As this type of development is evident in the land conversion process on the urban fringe it would be appropriate to develop a spatial model of land conversion to analyze the efficiency of the market and effects of tax policy.

Residential demand viewed spatially, with value per acre on the vertical axis and distance from the service center on the horizontal plane, would appear as a cone centered on the central service location. Consideration of the other demand determining characteristics would have the effect of distorting the cone by broadening the base in the direction of favorable development characteristics and narrowing it in the direction of unfavorable characteristics. A horizontal slice of the cone at any particular value will result in an iso-development ring. Assume the city center is the central service location at which all land has the same development value. Figure 1

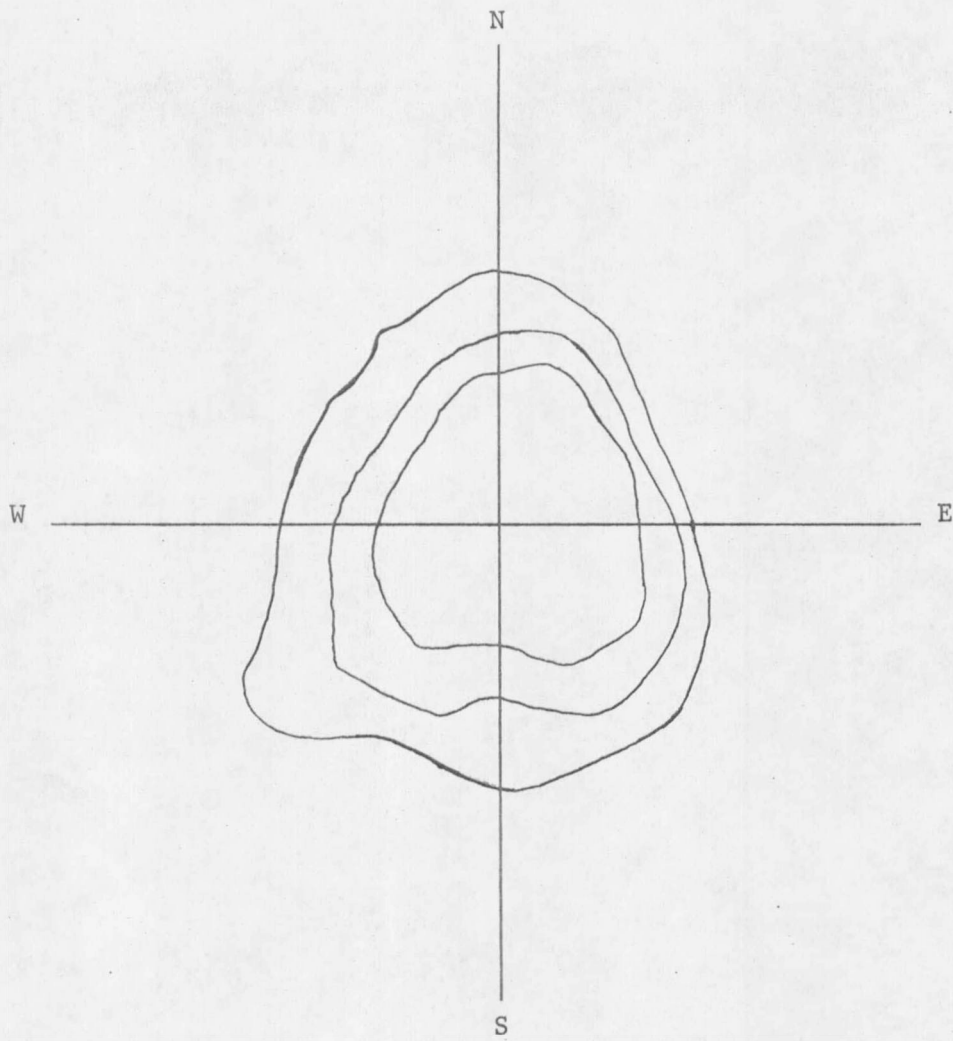


Figure 1

Iso-development rings

shows three hypothetical iso-development rings as they would appear by viewing the area from directly above. The farther from the city center the lower the value per acre on the rings.

To simplify the exposition, for the remainder of this paper the assumption is made that residential demand decreases with increasing distance from the service center to avoid the problem of divergence in an iso-development ring. It is possible for more distant land to have a higher residential value than land closer to the city center. This would result in a valley in the demand surface and two points at different distances from the city center with equal value.

A developer seeking to purchase land of a particular quality for residential use would be indifferent between which landowner along that ring he purchased from, so competition along the ring would be evident. Besides competing with other landowners on the iso-development ring, a landowner must compete with other landowners on other iso-development rings between which the developer is indifferent at the indicated prices. It is likely that there is enough competition so anyone who desired to buy or sell a parcel of land at any time could do so, and that the price would be close to the price indicated by the iso-development plateau on which the land was situated. This is the rationale behind the comparable sales method of land valuation. This does not imply that all land on an iso-development ring can be sold at the indicated price because each

sale is likely to alter the entire demand surface.

The demand for land for development can be depicted by vertically slicing the demand surface through the central service location. The resulting graph, Figure 2, shows land values as a function of distance for a slice along the east-west axis. The agricultural value of land is indicated. The development value of land is highest at the service center and value decreases as distance from the service center increases. Curve (1) represents the development demand for land lying east and west of the city at some given time.

Appreciating land prices are consistent with upward shifts in demand over time. The shifts need not be parallel and uniform throughout. In Figure 2, two hypothesized shifts are depicted for two time periods (years) for land lying due east of the city. Curve (2) shows the position of the development demand curve in year 2. Curve (3) depicts the position of the demand curve in year 3. The shifts being considered here are real shifts in demand and not price increases due to inflation.

The owner of land two miles from the service center (vertical line 2) finds his land appreciated $(b-a)/(a-o)$ percent the first year and $(c-b)/(b-o)$ percent the second year. The owner of land four miles from the city center (vertical line 4) experiences $(e-d)/(d-o)$ percent appreciation the first year and $(f-e)/(e-o)$ percent the second

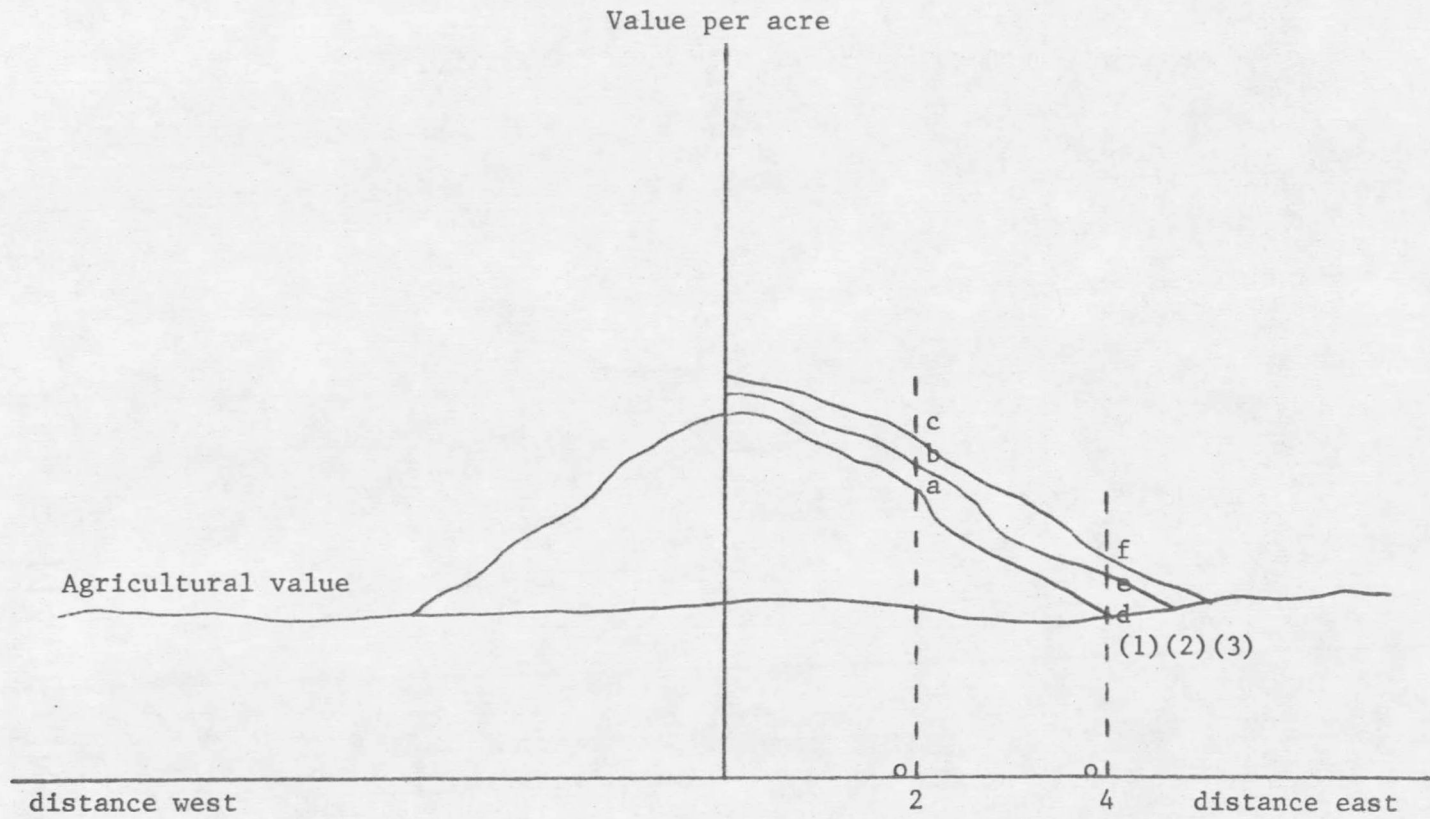


Figure 2

Development demand and appreciation

year. Land appreciation is likely to play a part in the land-owners' decision process.

With this background a mathematical formulation of the transition of agricultural land to residential use can be developed. The first model is developed with the assumption that property taxes are computed on full market value and that the tax rate is constant over time.

Define: $F(t)$ = net farm income in year t before property taxes;

r = interest rate, or rate of return on the next best alternative investment;

$V(t)$ = expected price of the land in year t ;

b = tax rate;

$P(t)$ = present value of the land in year t .

To maintain consistency, the prices and rates are measured in real terms to remove the effects of inflation. The following adaptation of the Owen and Thirsk [7] formulation of present value is appropriate:

$$P(0) = \int_0^t F(x)e^{-rx} dx - \int_0^t bP(x)e^{-rx} dx + V(t)e^{-rt} - \int_t^{\infty} bV(x)e^{-rx} dx$$

The present value of a parcel of land is the discounted stream of annual income net of property taxes from agricultural activity for the period of such activity, plus the discounted expected value

of the land at conversion time less the discounted annual property taxes accruing to the present owner. The property tax term is split into two integrals in this general form to accommodate the incorporation of property tax subsidies and penalties in the later analysis. The rationale behind this formulation is the complete capitalization of future property taxes by the current owner. For example, if a tax rate increase was announced for the coming years a prospective purchaser would capitalize the increase into a lower present purchase offer. The property tax cannot be shifted to future owners. Pasour [8] finds evidence of complete inter area tax differential capitalization. It is rational to expect the current owner to bear the full burden of the tax because of this capitalization process.

Assuming agricultural landowners are profit maximizers, they will attempt to maximize the present value of their land holdings with respect to conversion time. At that time the land will be converted to residential use. The conversion time can be found by differentiating the present value expression with respect to time and setting the derivative equal to zero.

$$\frac{dP(o)}{dt} = F(t)e^{-rt} - bP(t)e^{-rt} + V'(t)e^{-rt} - rV(t)e^{-rt} + bV(t)e^{-rt} = 0$$

$$= (e^{-rt}) (F(t) - bP(t) + V'(t) - rV(t) + bV(t)) = 0$$

Price and expected price are equal at the time of sale so the tax terms cancel each other and the following expression of conversion time it left:

$$F(t) + V'(t) = rV(t) = 0$$

$$r = \frac{F(t)}{V(t)} + \frac{V'(t)}{V(t)}$$

The optimum time to convert the land is when the sum of the rate of return from agricultural activity and the rate of appreciation of the land are equal to the rate of return on the next best alternative investment. Second order conditions require that this sum be approached from above, or that the sum must be decreasing at conversion time. Property tax rates do not enter into the optimizing conditions and this leads Owen and Thirsk [7: 258] to conclude:

. . . Land taxation cannot be considered as a policy instrument for the purpose of influencing private land use decisions. . . . We believe that this result stems from the fact that the property tax is capitalized and therefore does not affect land use decisions. Changes in current property taxes would alter the wealth of current landowners but would not affect their decisions on land allocation.

The conversion decision may be shown graphically. Referring to Figure 2, in year 1, land four miles and farther from the service center experiences no appreciation. In year 2, land four miles from the service center experiences increasing appreciation. As time progresses the rate of appreciation declines. The farther land is from the service center, the longer it takes for the appreciation

cycle to begin. Figure 3 shows a family of curves. Each curve represents land of a given distance (miles) from the service center with the index number referring to this distance. Disregarding the agricultural return of the land for the moment, each curve traces the relationship between appreciation and time for each distance. The optimal conversion time under this simplification is given by the solution of

$$r = \frac{V'(t)}{V(t)}$$

in the variable t .

The second order conditions for maximization require that conversion occur when the sum of the rate of agricultural return and the appreciation rate are falling. With this in mind Figure 4 shows the relationship between the time of conversion and the distance of the land from the service center. The real interest rate, r , is the marginal cost of holding land, the opportunity cost of not investing in an alternative investment and is assumed constant over time. The real appreciation rate is the marginal revenue obtained by holding the land for an additional time period. The landowner maximized profit by converting the land to residential use when his marginal revenue is equal to his marginal cost and marginal revenue is falling or marginal cost cuts marginal revenue from below. Still neglecting agricultural income, it is seen in Figure 4 that a landowner one mile from the service center should convert his land in year 1, and

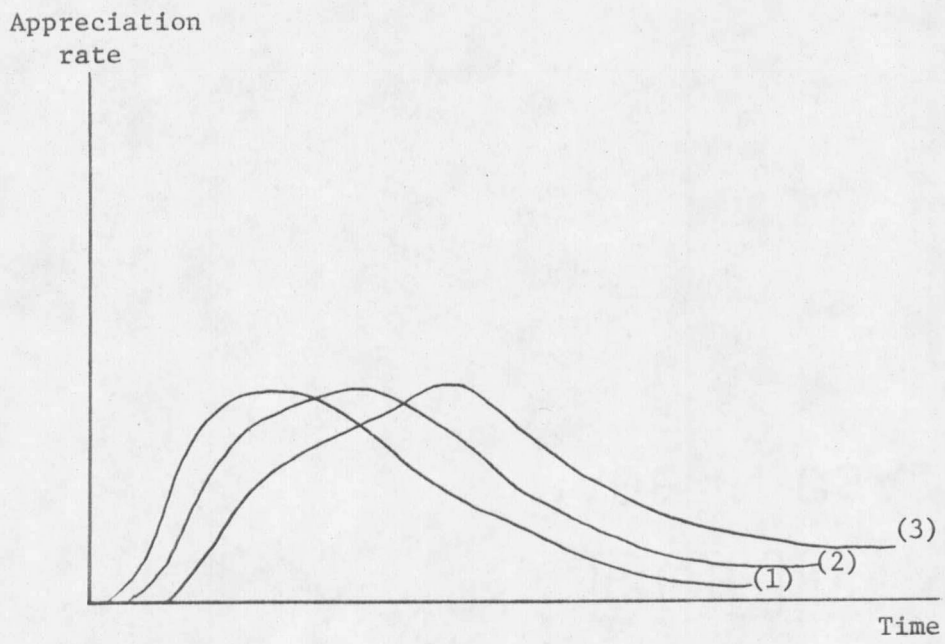


Figure 3
Appreciation curves

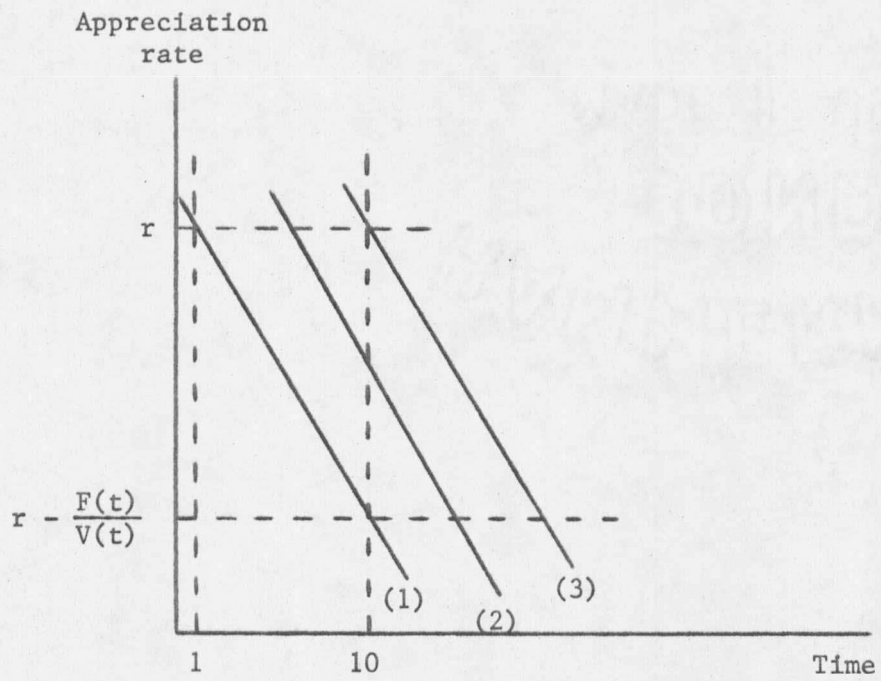


Figure 4

Optimal conversion conditions

a landowner three miles from the service center should convert in year 10.

If the agricultural return is now allowed to enter the decision process, the optimal conversion time criterion may be rewritten as

$$r - \frac{F(t)}{V(t)} = \frac{V'(t)}{V(t)} .$$

Assuming $F(t)$ is constant over time, as land enters the appreciation or "ripening" state $V(t)$ increases. This implies that the left hand side of the criteria is a positively sloped line that shifts to the right with increased distance. Figure 5 shows two appreciation curves, (1) and (2); the constant interest rate, r ; and the two left hand side conditions associated with (1) and (2) labeled (1') and (2'). Assume (1') and (2') are associated with the most productive agricultural land at the respective distances from the city. If the productive capability of the best land at different distances from the city is relatively uniform, a constant appreciation rate will be associated with the conversion of the best agricultural land at any distance from the city. This rate in Figure 5 is labeled $r - F(t)/V(t)$. In between r and $r - F(t)/V(t)$ there are a number of appreciation rates. A movement from r towards $r - F(t)/V(t)$ indicates the appreciation rate associated with the conversion of increasingly productive agricultural land.

In Figure 4, land at distance one with very little agricultural

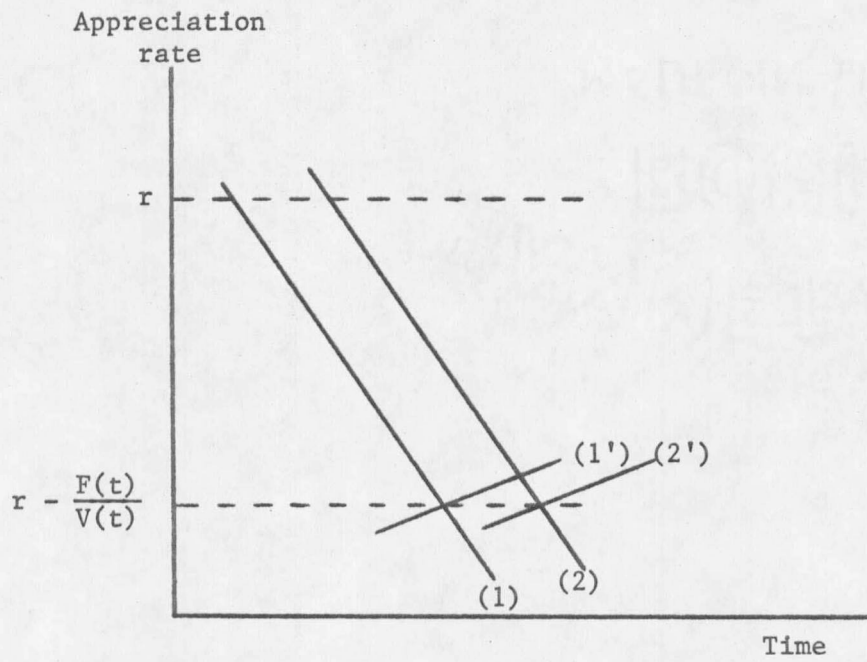


Figure 5

Conversion of non-homogeneous land

value would be converted at time 1. The very best agricultural land at distance one would be converted at time 10. Also at time 10, the poorest agricultural land at distance three from the service center would be converted. The amount of sprawl is the difference in the distances associated with the time interval between conversion of the poorest agricultural land and the best agricultural land. In this example there would be two miles of sprawl.

The implication of ad-valorem taxation with a uniform tax rate is that allocation is not affected by the tax. It was previously stated that an efficient allocation among agricultural uses is attained because land will always be employed in its highest and best agricultural use. A question arose whether the conversion of non-homogeneous agricultural land to another use is efficient. Assuming residential use is independent of agricultural productivity, inefficient allocation would occur when productive land is converted before less productive land because the value to society of employing a unit of poor agricultural land in agricultural production is less than the value of employing a unit of better agricultural land in agricultural production. An efficient allocation is when the marginal value of the last unit of land employed in agriculture is equal to the marginal value of the last unit employed for residences. It was shown that agricultural productive quality is considered in

the market for converting land from agricultural to residential use. The poorest agricultural land is converted before the prime agricultural land at any given distance resulting in the relative preservation of prime agricultural land. Since there are no apparent externalities involved in planning for future food production, the market dictates the socially optimal allocation. The first goal of MELDA, prime agricultural land preservation, is attained by the market.

Urban sprawl, the logical result of the allocation process, results in external costs that preclude optimum social allocation. These externalities can be internalized thus making the second goal of MELDA, sprawl reduction, a desirable goal. The analysis will be conducted in Chapter III. First, two conventional policies for influencing land-use are presented.

USE-VALUE TAXATION

The full value assessment behavioral model indicates that the land market, in the absence of externalities, will allocate land to maximize economic efficiency. There is legislation in several states granting use-value assessments to agricultural land. The behavioral model for this type of assessment will now be presented. It is assumed that at conversion full value taxation is resumed.

Defining use-value as the capitalized value of agricultural

income, the appropriate taxable value for agricultural land is $F(t)/r$. Incorporating this, the present value function becomes:

$$P(o) = \int_0^t F(x)e^{-rx} dx - \int_0^t b \left[\frac{F(x)}{r} \right] e^{-rx} dx + V(t)e^{-rt} - \int_t^{\infty} bV(x)e^{-rx} dx$$

The landowners optimum conversion time is:

$$\frac{dP(o)}{dt} = F(t)e^{-rt} - b \left[\frac{F(t)}{r} \right] e^{-rt} + V'(t)e^{-rt} - rV(t)e^{-rt} + bV(t)e^{-rt} = 0$$

$$(e^{-rt}) \left(F(t) - b \left[\frac{F(t)}{r} \right] + V'(t) - rV(t) + bV(t) \right) = 0$$

$$- rV(t) - b \left[\frac{F(t)}{r} - V(t) \right] = - F(t) - V'(t)$$

$$r + b \left[\frac{\frac{F(t)}{r} - V(t)}{V(t)} \right] = \frac{F(t)}{V(t)} + \frac{V'(t)}{V(t)}$$

The optimum conversion time is when the sum of the rate of return from agricultural activity and the appreciation rate is equal to the interest rate less the subsidy rate. The subsidy rate, S , is the

term

$$b \left[\frac{\frac{F(t)}{r} - V(t)}{V(t)} \right].$$

Since agricultural value is less than market value, S will be negative and its magnitude will depend on the difference between the two values. $V(t)$ is independent of agricultural value, therefore the subsidy will be larger for poorer agricultural land than for better agricultural land. Figure 6 exhibits the results. The rates r and

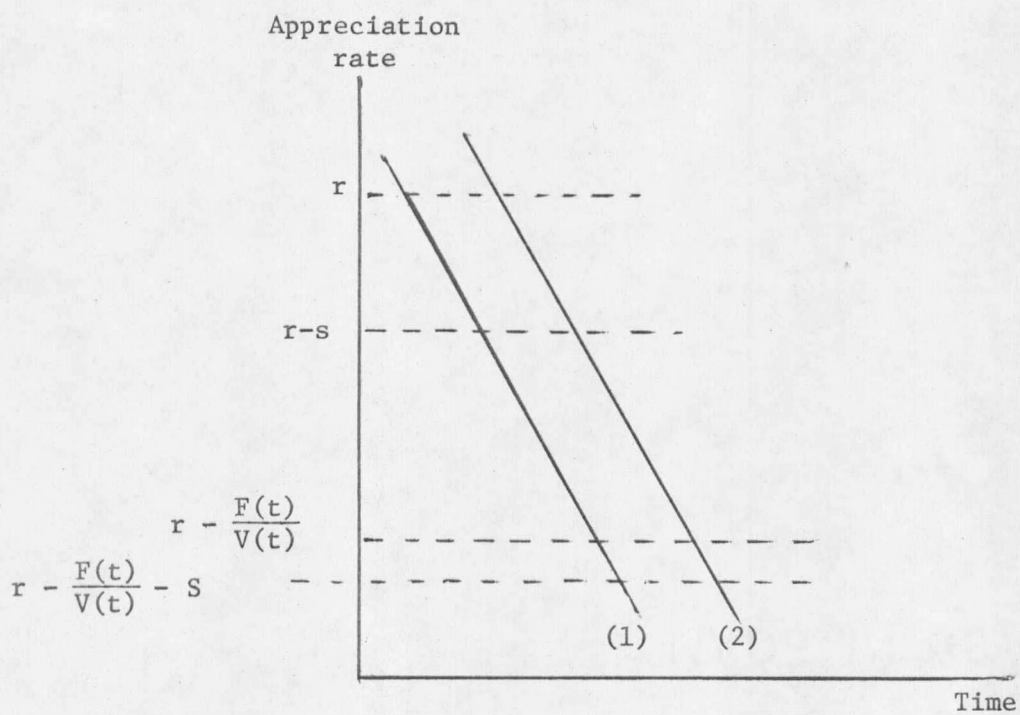


Figure 6

Optimal conversion with preferential taxation

$r - F(t)/V(t)$ are the same as in Figure 5. The rate of appreciation at which the poorest agricultural land will be converted is now $r - S$. The appreciation rate associated with the conversion of the best agricultural land is $r - F(t)/V(t) - S$. Since the subsidy is inversely related to the productivity of the land, the range in the appreciation rates associated with the total conversion of land at a given distance is decreased. This implies that sprawl will be decreased.

The reduction of sprawl has not been achieved without cost. One of the costs involved is the cost of inefficient land allocation. Another cost results because the tax base has been reduced by granting use-value assessments, consequently the overall tax rate must be increased to maintain local tax revenue. In a New Hampshire study of the tax rate increase necessary to compensate for the lost tax base Ching and Frick [1: 604] found the following results:

<u>Population of town</u>	<u>% increase in tax rate</u>	<u>% of total population affected</u>
Under 500	8.31	2.8
500 - 2999	1.93	26.4
3000 - 100,000	0.24	70.8

A deferred payment scheme where a roll back tax is imposed at the time of conversion will be a compromise between the market value and use-value assessment models. If the roll back period is very short a deferred payment scheme will approach the preferential

use-value scheme. If the roll back period is long, and interest is charged, the decision of the landowner will approach the decision under the full value scheme.

ZONING

Zoning is another policy that is used to influence land use. If agricultural zones are established and the zones are strictly enforced, conversion to residential use will be impossible and agricultural activity will be the only use. Sprawl in agricultural zones would be eliminated and agricultural land preserved in an absolute sense. It was shown that absolute preservation of agricultural land is not consistent with efficient allocation. In the absence of an uncorruptable omniscient zoning authority, it is doubtful that economic efficiency would be improved by letting a zoning authority dictate which land is to be converted.

CHAPTER III

APPLICATION OF THE MODELS TO MELDA

MELDA provides for the establishment of county wide zoning. The county government designates the areas to be zoned for agricultural use and the landowner then subclassifies into the category he desires. Conversion or use restrictions are associated with the various categories as well as varying property tax assessments.

Zoning functions through the alteration of individual property rights. According to Demsetz [2] property rights define how an individual may harm or benefit himself or others. If the actions of an individual result in externalities, internalization can usually be achieved only by altering the individual's property rights.

One of the fundamental property rights of the landowner is to use his land as he desires (within existing regulations). The intent of the subclassification provision of MELDA is to induce landowners to forfeit their development rights in exchange for lower property taxes. From the rational landowners point of view, if the present value of the annual tax savings is less than the present value of the property rights foregone for the contract period, he shouldn't contract. This is likely to be the case for land close to the optimum conversion time. In California when use-value assessment is granted in exchange for a contract to not convert land from agricultural use for a specified time, Hansen and Schwartz [5] found

participation was predominately confined to areas not immediately affected by development. Distant landowners will take advantage of the decrease, and to the extent development potential is not expected, the decreased tax will be capitalized into land values.

One of the criteria Hady [4] proposes for evaluating tax policy is ease of administration and compliance. If there is any virtue in MELDA, it is not in administration. The provision of owner subclassification imposes needless costs and difficulties upon the local tax assessing agency. Additional loads and complexities are likely to result in more errors.

If there are any externalities in converting prime agricultural land they cannot be internalized without altering the individual's property rights. Allowing the individual a choice will not internalize any externalities because when the property right is valuable, and the externalities arise, the individual will not forego his property right. The result of the entire complex zoning provision could be achieved with a simple use-value assessment scheme.

It was shown that use-value or preferential assessment could reduce sprawl. The reduction in sprawl was achieved at the cost of a tax rate increase and some inefficiencies in the transition of agricultural land of different productivity levels into urban use. One might conclude that the tax rate increase is relatively small and therefore of no great consequence; however, the burden must be

considered. The external cost of sprawl results in higher property taxes for everyone. A reduction in sprawl would decrease the tax rate, but to achieve the reduction in sprawl by this method requires a higher tax rate. The net effect will tend to leave social welfare unchanged because to reduce sprawl, subsidies in the form of tax reductions are granted to the landowners whose actions result in sprawl. The quantitative net effect is indeterminate and society could be either better or worse off. In order to internalize the external cost of sprawl, the cost must be borne by the individual producing the externality. This does not necessarily mean that use-value assessment has no desirable qualities and should not play a role in tax policy.

Under full value assessment a landowner with low income may not have the money to pay his property taxes. Even though the landowner has a parcel of valuable, ripening property the tax collector requires cash. His conservative banker may not lend any money based on this ripening collateral. As a result, the landowner may be forced to convert before the optimal time in order to pay his taxes. Such a conversion results in inefficient land allocation. Use-value assessment, by pegging the property tax to current income, may avoid a forced conversion.

If the preferential use-value assessment scheme is used, allocative inefficiencies will result because relatively larger sub-

sidies are granted to the owners of poorer agricultural land. This delays the conversion of the poorer land more than it delays the conversion of the better land. The order of conversion will remain optimal but the time of conversion will be sub-optimal.

A deferred payment scheme would also nullify the effect of an imperfect capital market and has the advantage of being more efficient. If the roll back period was long enough to recapture all of the subsidy granted to the landowner, a totally efficient allocation would be achieved in the absence of externalities.

McMillan [6] points out the imperfection of not providing open space in developments. It is socially desirable to have open space in developments and property values are higher where open space is provided. Collectively all landowners know that they would be better off if open space were provided; however, where there are a number of landowners an attitude of expecting one's neighbor to provide the open space develops and consequently no one provides the open space. The deferred tax payments from use-value assessment might be used to provide open space thus nullifying this imperfection.

MELDA incorporates a tax penalty for converting land in addition to the tax breaks for not converting. The tax penalty varies with the distance of the land from the city. Three rings of land around the city constitute the areas for the tax penalties. These penalties, hereafter referred to as correction taxes, are negative, i.e.

subsidies, in the case of non-productive agricultural land.

In general the corrective tax will alter the present value expression to:

$$P(0) = \int_0^t F(x)e^{-rx} dx - \int_0^t bP(x)e^{-rx} dx + V(t)e^{-rt} - \int_t^{\infty} cbV(x)e^{-rx} dx$$

The modifying term, c , in the future tax expression is less than one if conversion is desired and greater than one if conversion is penalized. The optimum conversion time is given by the solution of

$$\frac{V'(t)}{V(t)} = r - \frac{F(t)}{V(t)} + b(1 - c)$$

in the variable t . If the corrective tax is negative, as MELDA prescribes for non-productive land, conversion will occur at a higher appreciation rate. This is consistent with earlier conversion of this land and will logically result in more sprawl. If the strict definition of non-productive agricultural land used in the act is applied in selecting which land is to receive a negative corrective tax, this result may be no problem since practically no land would qualify. If a more liberal definition is used and poorer quality land is granted negative corrective taxes, this provision is in direct conflict with the goal of sprawl reduction.

When only single rate positive corrective taxes or penalties are incorporated in the tax policy the effect will be similar to use-value assessment. The appreciation rate associated with

conversion of the poorest agricultural land will be reduced by $b(1 - c)$. The appreciation rate associated with the conversion of the best agricultural land will likewise be reduced by $b(1 - c)$. Under these circumstances all conversion would be halted when the law first took affect. After this time period passed, the corrective tax would have no effect on the order and timing of land conversion.

A positive corrective tax that increases with distance will reduce the appreciation rate associated with conversion more for distant land than for land closer to the city. Since the external costs of sprawl usually increase with distance, a penalty that increases with distance, will tend to internalize these costs and decrease sprawl. The problem with MELDA's approach from this standpoint is that standard penalties are designated for each ring. It is doubtful that the conversion of every parcel of land in the ring from four and one half to fourteen and one half miles from the city will impose the same external cost on society. The purpose of the corrective tax is to internalize the burden. Any tax that does not just internalize the burden will result in economic inefficiency.

The positive and negative corrective taxes of MELDA are inconsistent. The negative taxes increase sprawl and the positive taxes may decrease sprawl. The negative taxes increase the social burden by granting subsidies to some landowners and encouraging sprawl

development which results in more social costs while the positive taxes tend toward the internalization of the same external costs for other landowners. These inconsistencies arise because of fuzzy thinking in the establishment of the goals and in the type of policy necessary to attain the goals.

The goal of prime land preservation was shown to be attained by the market. The goal of sprawl reduction is beneficial to the extent there are external costs associated with sprawl. The tax policy should just internalize these costs in order to attain the socially optimal land use. Since an ad-valorem tax is unlikely to do this an alternative might be considered.

A corrective tax equal to the present value of the future externalities resulting from conversion may be levied at the time of conversion. Such a lump sum tax would be the easiest to administer and collect; however, accurately determining the future magnitude of the externalities poses a problem. Another alternative is to levy special taxes on suburban dwellers equal to the external costs they impose on society. The externalities arise from a number of factors and every factor would need to be calculated for each household. If econometric studies indicated a simple relationship could be used to accurately estimate the costs, such a policy may not be too difficult to administer and would have the advantage of being flexible in a changing world.

CHAPTER IV

CONCLUSIONS AND POLICY RECOMMENDATIONS

Before developing any tax policy designed to influence land use, the goals of such a policy need to be scrutinized. The question of what is to be accomplished and why it needs to be done should be justified before deciding how it is to be done. In the case of MELDA, the question of why a tax policy to influence land use is needed has not been thoroughly investigated.

The first goal, prime agricultural land preservation, is difficult, if not impossible, to justify. If the potential of future food shortages is real, entrepreneurs in anticipation of high food prices will secure and preserve productive agricultural land in hopes of earning economic profits in the future. The fact that agricultural land is valued according to its earnings potential implies that the socially optimal allocation, if no externalities exist, is being achieved by the market.

The second goal, curbing urban sprawl, might be justified on the grounds that externalities exist because of sprawl. Scattered developments result in an increased demand for government provided services. The cost of providing these services to scattered areas is greater than the additional tax revenue generated by the development, resulting in the additional costs being borne by society in the form of higher tax rates. If one believes sprawl is directly

related to the externality involved, the goal might be justified. Since the relationship between sprawl and the externality that results from sprawl is not likely to be solely dependent on distance, a more viable goal is to internalize the externalities associated with each conversion from agricultural to residential use.

The two goals of MELDA were shown to be inconsistent. To preserve prime agricultural land requires an increase in sprawl as scattered areas of poorer quality land will be converted. To reduce sprawl requires that prime agricultural land in the path of development be converted. If the purpose of the tax policies of MELDA are to internalize the external cost of land conversion in order to maximize the social welfare from land use, the single goal should be stated as such. With a justified goal in mind one might be able to design a tax policy to achieve that goal.

Various policies might be used to influence land use. Zoning will influence land use through the direct alteration of individual property rights. If it is not strictly enforced, i.e. no variances, the problem with zoning is that without an omniscient resource allocator dictating the variances, it is doubtful that an optimal allocation could be attained. MELDA provides for zoning and then enforces the zoning provision with specified tax changes. Since the tax change is the enforcing provision, the rigmarole of zoning is unnecessary. If the zoning is serious then strict enforcement

is required.

The tax changes associated with the zoning enforcement may influence land use if properly applied. The problem of internalization requires an alteration of the individual's property right. The conversion right is valuable to a landowner whose land is experiencing conversion potential so he will elect not to forego his right when this time approaches. This indicates that the voluntary tax enforcement of the zoning provision renders this entire portion of the act totally useless, that is, no benefits are derived from it. Since the zoning and subclassification part of MELDA is supposed to encourage prime agricultural land preservation, MELDA is a high cost method of not achieving an unnecessary goal. The desirable goal of efficient land use could be achieved at zero cost by the market system.

The non-voluntary corrective tax applied at conversion will tend to internalize the burden of sprawl by penalizing the conversion of more distant land. MELDA obstructs the beneficial effects of this tax by granting tax incentives to encourage the conversion of some land, which conversion results in external costs, thus assuring a sub-optimal allocation of land. The beneficial portion of the act is not designed to internalize the specific costs of sprawl but is a "stab in the dark" approach to internalizing the costs in general by instituting a standard penalty in a broad area. Such an approach

is as likely to increase the net inefficiency as it is to reduce the inefficiency due to the externality.

Since MELDA is a high cost policy likely to degenerate the land allocation process, one might ask, what is an optimal tax policy with respect to land use? It was shown that the market system is deficient only because of the externalities of conversion, possible imperfections in the capital market, and in not providing open space or parks in development projects. All three of these can be corrected with a simple two part tax policy.

The externalities could be internalized by taxing each conversion for the amount of the externality caused by that conversion. It would be necessary to make the tax equal to the external cost in order to achieve the optimal allocation. This might be done by determining the relationship between costs and development features and using this relationship to predict the amount of the externality. Once the amount is determined the tax can be collected with the regular property taxes annually, or a lump sum collection equal to the present value of the future external costs could be collected at conversion. The annual special assessment has the advantage of being flexible with respect to changing conditions.

The effects of imperfections of the capital market can be nullified by deferred tax payments for ripening agricultural land. The lower taxes may prevent a forced conversion to pay the taxes and the

deferral or roll back, if it is long enough, will recapture the entire subsidy resulting in an optimal conversion. Even with an optimal conversion the design of the resulting development may not be socially optimal if it lacks desired park or open space areas. If the roll back tax was used to provide the desired open space, either through a credit to the landowner for providing open space or the outright purchase of open space, everyone would benefit.

This alternative policy would be much easier to administer than MELDA in addition to its being conducive to optimal land use allocation. As with any policy, the benefits and costs need to be considered. If the benefit of any increase in the efficiency of land allocation is less than the cost to achieve that benefit, society will be better off without that tax policy.

APPENDIX

APPENDIX

The following are portions of House Bill Number 672, Chapter Number 549, Montana Session Laws of 1975 enacted by the forty-fourth legislature of Montana and approved by the Governor of Montana on May 13, 1975.

84-7502. Policy. The legislature finds that we as a state are currently facing problems in our economic development that will not only cause concern to our state's future but also cutbacks in our state's growth and currently lack to proper development. Inasmuch as many of those economic concerns are based on land use decisions, the state should develop a land use policy which will direct Montana's land use growth through the enactment of a program which will:

- (1) enable local control and local decisions to be foremost in determining the state growth pattern;
- (2) allow taxation on land and structures to be based on proper land utilization; providing for tax incentives for proper land utilization and tax increases for land developmental abuse;
- (3) create a land use policy which does not block economic progress, but rather the development of a program which will meet the social and economic standards necessarily brought about through economic progress;
- (4) develop a program which protects our state's beauty and natural features as well as our heritage of agricultural wealth by curbing urban sprawl; and
- (5) institute a land use system growth program which supplements zoning and which is structured through local control, and one which is not to be final in action, but rather one of continuing action, whereby land use decisions can continually be reevaluated and one which would curb unnecessary governmental regulations.

84-7503. Purpose. Montanans are faced with a nation hungry for timber, coal, minerals, and recreation opportunities, causing a future in Montana whose heritage appears headed for rapid development and growth. This act, therefore, is designed to meet Montana's needs in a unique way; by reducing the need for zoning and other land control measures and placing our future development under a free market system controlled not by land regulation, but by economics. Specific

goals are:

(1) to protect prime agricultural land as it is the backbone of today's Montana economy and the heart of tomorrow's need for a well-fed and healthy economy, keeping Montana's position, in the future, as the breakbasket of the nation;

(2) to encourage urban growth in an inward pattern, rather than a sprawl development, yet through the use of open space provide a greater percentage of open land and a higher density on developed land within the urban area;

(5) in general, to provide for Montana a land use directional policy which will not regulate our future but rather motivate it into a pattern of desirable economic growth based on the development of private enterprise.

84-7504. Definitions. As used in this act:

(1) "Density" means the number of persons living on the land based on those established as residents per acre. In determining densities under the provisions of this act it shall be taken on the number of acres of the proposed development or portion of land developed plus the average density of the land adjoining the property and extending beyond it three hundred (300) feet in each direction.

(2) "Agricultural land" means land which is currently being used or could be used for floriculture, horticulture, silviculture, general farming, dairying, poultry raising, stock raising, and other agricultural related uses, including, but not limited to, buildings and activities as defined by section 84-437.2.

(5) "Productive land" means land that could be used for agricultural purposes for a profit following current land management practices in the following use categories:

- (a) irrigated cropland;
- (b) non-irrigated cropland;
- (c) pasture;
- (d) range;
- (e) irrigated native grassland;
- (f) forest and woodland.

For purposes of determining whether the land could be used for a profit, the nonagricultural development value of the land shall not be considered.

(6) "Nonproductive land" means land which will not support growth for the production of food and fibre for profit.

(8) "Planned development" means the development of a

piece of land in such a manner that is determined by the governing body to entail the highest and best possible development for that land, in a manner encouraging open space and high density use.

(12) "Residential land" refers to a district or portion of land in which the principal use of the land is for residential dwellings of varying densities designed to meet contemporary building and living standards.

(18) "Roll back" means the rolling back of a period of years for tax purposes. The taxes to be paid during this roll back period being the difference paid from the normal appraisal value and the appraised value determined by this act.

84-7509. Subclassification of land. Under the provisions of this act the land outside the jurisdictional boundary of a city or town, which is classified either agricultural or recreational may be subclassified by the owner subject to the terms of sections 84-7510 and 84-7511.

84-7510. Subclassification by owners of taxable land classified as agricultural. (1) Within two (2) years following the classification of taxable land as agricultural, an owner thereof shall elect to subclassify his lands into classes A, B, C, or D, or any combination thereof. The department of revenue, upon receipt of the owner's election, shall revise the previously appraised value of such lands as follows:

Class A -- appraisals shall be reduced twenty percent (20%) from their levels immediately preceding the classification;

Class B -- appraisals shall be reduced ten percent (10%) from their levels immediately preceding the classification;

Class C -- appraisals shall be reduced two percent (2%) from their levels immediately preceding the classification;

Class D -- appraisals shall be increased ten percent (10%) from their levels immediately preceding the classification, and may be revalued in future years as provided by law to reflect market value.

(2) The owner of class A land, his heirs, successors, or assigns, may not convert the use of such lands to any non-agricultural purpose for twenty-five (25) years, nor may the subclassification be changed for twenty-five (25) years.

(3) The owner of class B land, his heirs, successors, or assigns, may not convert the use of such land to any non-agricultural purpose for ten (10) years, nor may the subclassification be changed for ten (10) years.

(4) The owner of class C land, his heirs, successors, or assigns, may change the subclassification within the agricultural classification at any time, and may petition the department of revenue at any time for reclassification into another subclassification. The department may grant this petition provided that if the subclassification is to class D, it shall not be granted until the petitioner has first paid the difference in taxes which would have been paid since the subclassification or ten (10) years, whichever is less, if during that period the land had been subclassified as class D.

(5) The owner of class D land, his heirs, successors, or assigns, may petition the department of revenue for reclassification into another category at any time, which petition shall be granted.

84-7512. Valuation of residential land. After classification as residential land, whether occupied or not, the land shall not change in value for tax purposes unless it meets or is governed by the following provisions:

(1) Class A -- existing residential. Tax valuation changes shall be made in the following manner:

(d) If residential land is transferred from this category to any class of agricultural land, after the enactment of this act, there shall be an immediate reduction of value to the appropriate subclassification of the land into which the transferred land is reclassified.

(2) Class B -- new residential (single family). Any land which is converted to new residential shall be evaluated as follows:

(a) Land transferred from productive land shall be valued in accordance with the appropriate sections of this act with the following exceptions:

(i) Land indicated as a planned unit developed and approved by the governing body shall be classified for tax purposes at ten percent (10%) below the normal valuation in the area for similar developments.

(ii) Land transferred from nonproductive land to residential purposes shall be evaluated at the time of transfer in an amount to decrease the tax valuation as follows:

Land within the	20% a year for
jurisdictional	a period of 5
4 1/2 mile limit.	years

Land between 4 1/2 miles and 10 miles from the jurisdictional limit 10% a year for a period of 5 years

Land beyond 10 miles, measured from the (4 1/2) mile limit of the nearest incorporated city in a direct line 5% a year for a period of 5 years

(iii) Land taken out of production and transferred to residential shall, in addition to any other provision of this act, be increased in taxable valuation in the following amounts:

Land within the jurisdictional 4 1/2 mile limit of a community 2% a year for a period of 10 years

Land between 4 1/2 miles and 10 miles from the jurisdictional limit 10% a year for a period of 10 years

Land beyond the 10 mile limit, measured from the nearest incorporated city in a direct line 25% a year for a period of 10 years

(3) Class C -- new residential (multifamily). Land which is transferred from any use to multifamily other than planned unit development or recreational developments as approved by the governing authority in addition to any other provision of this act shall be valued as follows:

Existing Density	Change in Density	Increase (Decrease) in Appraised Value
0 - 1	+50%	+50%
1 - 3	+40%	+25%
3.1 - 9	+30%	+25%
9.1 - 18	+10%	+ 2%
Over 18	No change	No change

84-7520. Special conditions.

(1) Any land classified under this act may be, at the owner's option, reclassified at any time to a new classification within categories if allowed under the requirements of that classification as set forth in this act.

(2) Any increases in taxation to pay for the loss of revenue caused by this act shall be reflected in an increase in mill levies and not in an increase in the valuation of specific property.

84-7521. Rules and regulations. The state administering agency shall adopt such rules and regulations pursuant to Montana Administrative Procedure Act, as are necessary for the administration of this act.

84-7522. Exemptions from act. Application to those over sixty-two (62) years of age and to those existing below poverty standards. No provision of this act which has a negative or adverse taxation effect shall apply to a private residence owned by a person or persons over sixty-two (62) years of age or those in an income bracket established by the federal government to be below poverty standards.

84-7253. Changes in boundaries. After final adoption of a plan, the governing body, or any property owner may petition for a variance or a change in the boundary of any land use classification.

No petition shall be approved unless the petitioner submits proof that the area is needed for a use other than that for which the land is classified, and the following requirements have been fulfilled:

(1) The land is usable and adaptable for the use for which it is proposed to be classified or that a new use of the land would be more beneficial to the area; and

(2) Conditions and trends of development have so changed since the adoption of the existing classification, that the proposed classification is reasonable and desirable, and the land is capable of sustaining the use proposed; and

(3) That the proposed change shall offer the community relief from impact from an outside or uncontrollable influence facing the community because of new and substantial development.

Should the governing body approve the change in classification, it shall modify the existing land use plan to reflect such changes and change any taxable valuations as

may be necessary.

84-7525. Reappraisal by department. The appraised value of property shall always include any increases or decreases determined by the department of revenue pursuant to a reclassification plan adopted under its authority. Any increases or decreases in value specifically provided for under the terms of this act shall be made after consideration of all such reappraisals.

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REFERENCES

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