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On the Effectiveness of Agricultural Land-Use Controls

Eric Tarquin Marnell
Utah State University

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ON THE EFFECTIVENESS OF AGRICULTURAL LAND-USE CONTROLS

by

Eric Tarquin Marnell

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Economics

APPROVED:

UTAH STATE UNIVERSITY
Logan, Utah
1983
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Eric Tarquin Marnell
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ABSTRACT

On the Effectiveness of Agricultural Land-Use Controls

by

Eric Tarquin Marnell, Master of Science
Utah State University, 1983

Major Professor: Dr. W. Cris Lewis
Department: Economics

Land resources are a valuable resource in the economic system. There exists considerable controversy surrounding the allocation of land into the competing land uses. At the heart of this controversy are agricultural land resources. The purpose of this paper is to investigate, first theoretically and second empirically, the effectiveness of controls placed on land use to keep land in agricultural production.

A theoretical conclusion is reached as to whether the free market or land-use controls allocate land resources more efficiently. An empirical model is formulated to explain changes in the quantity of agricultural land as a function of several hypothesized explanatory variables, one of which is a land-control dummy variable to measure the effectiveness of agricultural land-use controls.

The general conclusion reached is that for the most part, the controls have been ineffective. Where they have been effective in influencing land-use allocation, questions still exist concerning the cost imposed upon society from the control influenced land allocation.

(101 pages)
CHAPTER I
INTRODUCTION

The conversion of agricultural land to urban and other uses continues to be a topic of considerable controversy. The heart of the controversy is embodied in arguments concerning the national supply of agricultural land, especially cropland. With a total cropland base in the United States of approximately 450 million acres, high stakes are involved for the production from that cropland represents a large input into and has a large effect on our economic system. Few can oppose the argument that this valuable resource has to be allocated efficiently. However, disagreements exist as to what is meant by an efficient allocation of land.

The purpose of the thesis is to study the effectiveness of agricultural land-use controls in stopping or reducing conversion losses from the total cropland base. The purpose of this introductory chapter is to present arguments for and against agricultural land-use controls. A conclusion is reached as to whether the control-influenced land allocation is theoretically superior to a market allocation of land.

The Market Allocation of Land

The goal of any economic system is, whether it be socialistic or capitalistic in structure, to allocate resources (i.e., land, labor, and capital) to meet some predefined objectives. In a competitive market
facing competing objectives for resources, it can be shown that such
decisions will lead to an allocation of resources which is Pareto
efficient in the absence of externalities, collective goods, and any
monopolistic or monopsonistic elements.

The concept of Pareto efficiency has one drawback; it takes as
given the existing income distribution, thereby, ignoring any equity
considerations. However, accounting for equity is not straightforward
for who is truly qualified to determine the most equitable income
distribution? With less than perfect knowledge about the effects of
income equalization measures on work effort (it depends on the initial
assumptions about the marginal utility of income and the marginal
utility of leisure), equity considerations reduce to value judgements
about what the distribution of income should be. Taken too far,
 Attempts to achieve an "equitable" distribution of income may reduce
work effort and income. The market will therefore allocate resources
efficiently. Pareto efficiency is a powerful operational concept aiding
the resource reallocation process.

The decentralized decisions inherent in a competitive market will
result in almost continual resource reallocation. Some industries
expand while others decline. For example, Table 1 illustrates, for the
most part, market induced employment changes for selected industries
between June, 1972 and June, 1982. While the social system is sensitive
to the problems associated with these economic adjustments, they are
viewed as necessary to the efficient operation of the economic system.
With economic efficiency, resources or factors of production are allowed
to move to their highest value or best use. Decentralized market
TABLE 1.

CHANGES IN INDUSTRY EMPLOYMENT, JUNE (1972) TO JUNE (1982)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th></th>
<th>1972-1982 Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Oil and Gas Extraction</td>
<td>264,000</td>
<td>717,400</td>
<td>+453,000</td>
</tr>
<tr>
<td>2. Medical Instruments and Supplies</td>
<td>93,200</td>
<td>161,300</td>
<td>+ 68,100</td>
</tr>
<tr>
<td>3. Newspapers</td>
<td>377,100</td>
<td>425,300</td>
<td>+ 48,200</td>
</tr>
<tr>
<td>4. Engineering and Scientific Instruments</td>
<td>64,300</td>
<td>76,000</td>
<td>+ 12,000</td>
</tr>
<tr>
<td>5. Copper Ores</td>
<td>38,900</td>
<td>24,300</td>
<td>- 14,600</td>
</tr>
<tr>
<td>6. Highway and Street Construction</td>
<td>363,800</td>
<td>251,800</td>
<td>- 112,000</td>
</tr>
<tr>
<td>7. Blast Furnaces and Basic Steel Products</td>
<td>586,200</td>
<td>410,500</td>
<td>- 184,000</td>
</tr>
<tr>
<td>8. Motor Vehicles and Equipment</td>
<td>896,400</td>
<td>709,900</td>
<td>- 186,400</td>
</tr>
</tbody>
</table>

decisions facilitate this process by allowing individuals to maximize welfare and firms to maximize profit.

**Economics of Land**

To debate the issue of the optimal use of a particular resource such as land requires agreement on the objective function to be maximized. It is submitted that the objective is to arrive at the allocation of land that maximizes the aggregate value of all land rents. The economic rent on any resource will reflect its net contribution to national income for the time period specified and its worth to society. By maximizing rents, the objective of maximizing national income is achieved.

To achieve the objective, land is continually being converted and reconverted among uses as market conditions change. This is in response to price signals generated in the land market reflecting society's land-use preferences. With land resource mobility, resources are free to move to their highest and best use. Therefore, the reallocation of land among the various land uses that would take place in the market is optimal since the objective of maximizing national income is achieved. The market allocation is optimal (provided there are no significant distortions), since society it is able to capture larger rents (may or may not imply speculation) by foregoing land uses that yield a lower rent and by adopting those land uses with a larger rent.

**Arguments for a Nonmarket Land Allocation**

Agricultural land-use controls substitute government allocation for the market process. They are a nonmarket tool initiated in the
political arena that attempts to allocate or influence the allocation of land among the competing land uses. Many arguments are offered in support of a nonmarket allocation of agricultural land. The first argument relates to externalities. Open space associated with agricultural land use may provide positive aesthetic benefits or externalities for urban residents.

A second argument is that the market may not guarantee an adequate supply of agricultural land. Recently, large conversion losses from the total cropland base have been reported. If agricultural land supplies are decreasing, possible food shortages may result. If growth trends in world population persist along with the inadequacy of the vast majority of underdeveloped countries to meet their own domestic food requirements for self-sufficiency, severe world food shortages may result. Under this scenario, the United States could have reduced the food shortage impact by insuring an "adequate" supply of agricultural land that would make the export of larger quantities of agricultural products practical while at the same time limiting the impact on the domestic food market.

Another argument for agricultural land-use controls is the alleged difference between private and public land holder discount rates. If private holder discount rates are greater than public holder rates, private holders have a shorter planning horizon. This implies private holders are acting out of self-interest against the wishes of society, which the public holders are representing by a lower discount rate. Private holder discount rates do not reflect social time preference.

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Therefore, the private holder rate would underallocate land to decisions facilitate this process by allowing individuals to maximize agricultural production, thereby ignoring the preferences of society. Collective goods are another argument for agricultural land-use controls. Collective goods have two fundamental characteristics: 1) the impossibility of excluding consumers who do not pay for the good in question (nonexclusion), and 2) consumption by one consumer occurs without reducing the quantity of the good available for other consumers (nonrival consumption). The market will not allocate the socially optimal quantity because of these two characteristics. If local economic benefits derived from an agricultural economy may be classified as a collective good, the market will not allocate an efficient amount of land for agricultural land use. Agricultural land-use controls are justified to allocate land to agriculture if collective goods exist with agricultural land use.

If agricultural product and factor markets are not absolutely competitive, monopoly and/or monopsony elements exist. Economics has demonstrated how the pricing behavior of monopolists and monopsonists differ from that of the competitive market. For monopolists and monopsonists, price is determined as output decisions are reached. With respect to the land market, agricultural land-use controls might offset the socially inefficient pricing behavior. A second best solution may be obtained.

Another argument is presented with the belief that food is a merit good. Food is considered a merit good if it is believed to be such a basic human need that the private land market should not be allowed to determine the acreage devoted to food production. Food and fiber should
be provided to all as a "right" and should not be governed by market criteria. Instead, nonmarket criteria should allocate acreage for food production.

The last argument stresses the point that once conversion of agricultural land to other uses has taken place conversion back to agriculture is nearly impossible (irreversibility).

**Against Nonmarket Allocation**

Externalities are associated with some agricultural uses of land, but most of these are negative externalities that are supporting the notion that too much, not too little, land is in agricultural use. These negative externalities include the leaching of pollutants from chemical fertilizers and organic waste into underground acquifers and surface watercourses, noise and odors from dairy and feed lot operations, and the interference of farm machinery on roadways with faster moving vehicles such as automobiles. These can result in marginal social cost exceeding price with the conclusion that too many resources are being devoted to farm production.

Open space may provide positive aesthetic benefits for urban residents. However, other aesthetic benefits may exist. For example, housing developments can generate positive externalities. Urban residents in less affluent neighborhoods may drive through expensive housing districts, deriving pleasure from observing a quality of housing superior to their own.

If negative externalities predominate for agricultural uses of

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land, the externalities argument forwarded for agricultural land-use controls is weak. The valuation of all aesthetic preferences involved would be useful so that comparisons could be made.3

Arguments suggesting the future supply of agricultural land may be greatly reduced and unable to meet food requirements are lacking sufficient evidence. Projecting future economic activity is highly inaccurate. One only has to look at the poor performances of economists in forecasting future Gross National Product to see this. With respect to the supply of agricultural land, a simple example can be generated by citing trends that, when extrapolated far enough, result in a zero farmland base or at least an "inadequate" farmland base at some future date. To assess the future on the basis of an extrapolation of any historic trend is in error. Such an extrapolation will show what will happen if the conditions that brought about the trend in the first place continue into the future. To illustrate the errors inherent to that process, past data (1930-1978) on total cropland and agricultural labor were each regressed on time. The estimated equations were used to make an extrapolation of future values. Trends in the agricultural land base are summarized in Table 2.

The estimated equation for agricultural land is:

\[ AL = 476.02 - 0.24T \]

where \( AL \) is total cropland in millions of acres, and \( T \) is a time index

---

## TABLE 2

**CROPLAND IN THE UNITED STATES, 1910-78**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Change</th>
<th>Percentage Change</th>
<th>Total</th>
<th>Change</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>320</td>
<td>--</td>
<td>--</td>
<td>437</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1920</td>
<td>368</td>
<td>48</td>
<td>15.0</td>
<td>380</td>
<td>43</td>
<td>9.8</td>
</tr>
<tr>
<td>1930</td>
<td>382</td>
<td>14</td>
<td>3.8</td>
<td>480</td>
<td>--</td>
<td>-2.7</td>
</tr>
<tr>
<td>1940</td>
<td>368</td>
<td>-14</td>
<td>-3.7</td>
<td>467</td>
<td>-13</td>
<td>2.4</td>
</tr>
<tr>
<td>1950</td>
<td>377</td>
<td>9</td>
<td>2.4</td>
<td>478</td>
<td>+11</td>
<td>2.4</td>
</tr>
<tr>
<td>1959</td>
<td>359</td>
<td>-18</td>
<td>-4.8</td>
<td>458</td>
<td>-20</td>
<td>-4.1</td>
</tr>
<tr>
<td>1969</td>
<td>333</td>
<td>-26</td>
<td>-7.2</td>
<td>472</td>
<td>+14</td>
<td>3.1</td>
</tr>
<tr>
<td>1978</td>
<td>361</td>
<td>+28</td>
<td>+8.4</td>
<td>454</td>
<td>-18</td>
<td>-3.8</td>
</tr>
</tbody>
</table>


The equation is an extrapolation suggesting a long term trend reduction of 240,000 acres of land per year from the cropland base. Given the cropland base of the United States, the country would run out of cropland in about 2000 years.

The trend equation for farm labor is:

\[
(2) \quad FL = 13,070 - 191.6T
\]

where FL is the agricultural labor force measured in thousands of workers, and T is the same time index used in equation (1). The trend has been a reduction in agricultural labor of about 191,600 workers per year. This trend, if projected, would have the country running out of agricultural workers in the year 1998. The trends implied by these relationships suggest that by 1998, no workers will be farming 459 million acres of land!

In the market society determines the amount of land to be devoted to a particular use, such as agriculture, by voting with dollar votes. These dollar votes are reflected in land-use prices. A higher land-use price implies that society is attaching more dollar votes to a land use. If society desires more land in agricultural production more dollar votes would be devoted to agricultural land use which would in turn increase agricultural land prices. Through market prices, society will determine the optimal quantity of land for each competing land use in

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4 The equations were estimated from annual data. See Cris W. Lewis and Eric T. Marnell, "Agricultural Land Use and Land-Use Controls," Utah Science, Summer 1982. If estimated from the data in Table 2, the agricultural land equation becomes: \( AL = 477.8 - 0.676T \). This equation is suggestive of a long term trend reduction of 676,000 acres per year, with the country running out of agricultural land in about 700 years, p. 52.

5 Ibid.
order to maximize welfare.

Agricultural land-use controls stand in contrast to this process. They ignore the market generated price signals reflecting society's land-use desires. The controls would overallocate land to agricultural production based on the belief that the interests of future generations are not being looked out for and that past and current supplies of agricultural land have been and are inadequate.

As to the possibility of food shortages, the probability of that occurring in the United States is essentially zero. World food shortages are not only a possibility but a distinct reality for many persons. Very few areas of the world today are exempt from periodic food shortages. Unfortunately for some areas, food shortages are a continuing problem.

With a hypothesized growing world population, the export demand for United States agricultural products is expected to increase in the future. The importance of these exports in alleviating possible world food shortages is not significant. To claim that these exports, "mean the difference between life and death to millions of less fortunate people whose lives are marred by chronic hunger," is incorrect. According to Raup (1982):

...it is clear that the vast bulk of U.S. grain exports goes to feed livestock in countries that are not, by world food standards, among the impoverished. In short, young American families are being asked to forgo their homes in the suburbs so that American farmers can feed Russian cows.


7Ibid., p. 258.
In order for U.S. exports to help alleviate possible world food shortages, what is required is a shifting of current export patterns.

Although there is no general consensus as to the appropriate discount rate today, there is general concern that the low rates attributed by public holders may not reflect the current economic environment and may distort land-use decisions. To more accurately represent the discount rate, it is argued that the current opportunity cost of capital be considered. With empirical research demonstrating that actual public holder discount rates are far below the calculated opportunity cost of capital, investigation should be directed toward finding the true economic costs incurred by low public holder discount rates.8

To argue for the existence of collective goods associated with agricultural land uses, requires evidence. With evidence lacking, the collective good argument does not appear to be relevant since food and fiber product industries do not display collective good characteristics. Neither is any evidence presented suggesting that monopolistic and monopsonistic elements dominate the agricultural product and factor markets. These markets are characterized by a high degree of competition, perhaps more so than for any other sector in the economy. Finally, the merit good argument is not convincing since value judgements are to be made when considering a good for merit good status. With arguments presented for and against agricultural land-use controls, a conclusion may be reached as to the theoretically more efficient land-use allocation method.

Conclusions

Agricultural lands are a valuable natural resource, but are not the only valuable resource in the economic system. In a system that prizes economic freedom, to claim that agricultural lands must be preserved requires proof that society would be better off by that decision. Through the presentation of arguments for and against agricultural land-use controls, it was argued that a competitive market best determines the optimal allocation of land. Unless there is strong contrary evidence, land-use changes should be viewed as a demonstration that the economic system is working. That is, resources are being reallocated to the uses that are valued more highly by society. Justified or not, agricultural land-use controls exist and are being used. Given their existence, the objective of the remainder of the thesis will be to empirically investigate the effectiveness of agricultural land-use controls.

Thesis Objectives

The objectives of the thesis are to:

1. Measure the extent of state land-use controls; and
2. Test the effectiveness of state and county agricultural land-use controls.

The thesis is organized as follows. Chapter II describes the variety of agricultural land-use control laws. The controls are classified into two categories for the purpose of the thesis: direct controls and indirect controls. In Chapter III literature on the subject is reviewed. A mathematical model is developed in Chapter IV. The purpose
is to illustrate possible consumer and producer economic reactions to changes in certain variables that may ultimately affect land-use demands. Chapter V presents empirical models to estimate agricultural land-use direct control effectiveness. The empirical results are analyzed in Chapter VI. The important conclusion and policy implications are summarized in Chapter VII.

A summary of direct and indirect land-use control measures for each state responding to the survey constitutes the appendix.
CHAPTER II

LAND-USE CONTROLS

In the late 1960's and early 1970's, land-use planning received increasing attention from those individuals concerned with national land-use trends. The trends depicted a shifting pattern among the land uses away from agricultural to other uses. Operating with the belief that reductions in agricultural land-use were not socially desireable, land-use planning and agricultural land-use controls were looked upon to reverse this trend. Collective action on the part of these concerned individuals was necessary to bring about land-use planning since there numbers were small. A starting point was the political arena. There, the purpose of the collective action was to apply pressure on politicians to enact land-use planning legislation. To support their arguments, statistics relating to agricultural land conversion rates were cited. With the general electorate subjected to large publicity campaigns, numerous county and state agencies came under increasing pressure to adopt agricultural land-use controls, in one form or another, to preserve agricultural land. The purpose of this chapter will be to outline these controls on agricultural land use. Direct controls, or controls that have a direct influence on agricultural land use, are outlined first since the thesis is measuring their effectiveness. An outline of indirect controls then follows.
**Direct Controls**

**Agricultural Districting**

This designates specific tracts of land for long-term agricultural uses and is usually coupled with benefits and assurances to improve the conditions for farming. In most cases, no legally binding controls are imposed on land use. Contracts are usually signed by those individuals desiring that a district be formed with the contract being for some specified period of time. However, if an individual no longer wishes to be in the district he or she may get out of the contract commitment since district participation is voluntary. The ease with which an individual may get out of the contract commitment will depend upon at least two factors; the proposed land use change and the location of the land within the district.

**Agricultural Zoning**

A legally binding designation of land uses, including amount, type, and location of any development, is imposed with zoning. Agricultural zoning restricts land uses exclusively to agricultural and/or related uses. Often a large minimum lot size (10-160 acres) is called for in the zone to discourage subdivision, thereby, continuing its agricultural homogeneity. Zoning changes are not impossible for an individual parcel of land. The degree of success would depend on, among other things, the landowners economic, political, and religious power or influence in the community.

**Purchase and Resale or Lease with Restrictions**

This involves the purchase of land by government agencies, the
imposition of restrictions on its use and development, and resale back to any interested parties at the market price. The end result is equivalent to the purchase of development rights.

**Purchase of Development Rights**

A designated agency purchases the development rights from landowners of specific parcels, leaving the landowner all other rights of ownership. The price of the rights is the diminution in the market value of the land as a result of loss of the development rights. The remaining value of the land is the farm use value.

**Indirect Controls**

**Comprehensive Planning**

A process, usually political in nature, leading to adoption of a set of interrelated policies regarding land use, transportation, housing, public facilities, and economic and social issues. It may or may not include a land-use plan designating particular land uses. In most states, the plan in itself is not legally binding on governments or individuals. Instead, it serves as a set of suggested guidelines to follow. A few states do require that zoning and major public facility plans be consistent with their comprehensive plans.

**Development Permit System**

Requires that a special permit be acquired for development from the appropriate state or regional agency. The development permits are in addition to normal local zoning and building permits. The flow of development permits may be restricted if additional development is deemed undesirable. A similar approach would be to place an upper
limit on the total number of construction permits to be issued during a
given time period. The most drastic step would be to place a total
moratorium on all building.

**Differential Property Tax Assessment**

Different assessments are applied to agricultural lands in an
time attempt to keep them in agricultural use. Assessments are based on the
farm use value of the land rather than on its current market value which
reflects its development potential. The three major types of
differential assessment are: (1) pure preferential assessment, (2)
deferred taxation, and (3) restrictive agreements.

Pure preferential assessment is a reassessment of eligible land on
the basis of its current farm use value rather than its market value. Deferred taxation is similar to pure preferential assessment, except
that if land is converted to a noneligible use, a penalty is imposed on
the landowner consisting of the taxes he or she were excused from paying
for some specified number of years plus an interest penalty. The
penalty sum can be quite large.

Restrictive agreements require participants to sign a contract with
a designated public agency stipulating that the land will be devoted to
an eligible use during the contract length (typically ten years). The
participant then receives a current use value assessment on his or her
land. Penalties similar to those of deferred taxation are imposed when
land use is changed to a noneligible use.

**Nuisance Legislation (Right to Farm)**

This is usually embodied in legislation seeking to limit private
anti-farm nuisance lawsuits stating that state and local legislation
cannot be used to restrict "normal" day-to-day farming practices unless they endanger public health or safety.

**Transfer of Development Rights**

Development rights in an area designated for preservation may be purchased by a developer and transferred to a designated growth area. To begin additional development in the growth area, development rights must be purchased from landowners in the preservation area, thus, offering preservation area landowners at least partial compensation for the monetary loss they are incurring.

**Conclusions**

The controls outlined above are not a complete listing of available controls. They are general categories with many control variations possible in each. At a minimum, there are two purposes for their presentation. First, they are presented so that the literature review of Chapter III may be more easily followed. More importantly, they are presented so that a better foundation for a more complete understanding of the controversy surrounding agricultural land-use controls and the remainder of the thesis may be developed.
CHAPTER III
REVIEW OF LITERATURE

The literature review revealed the lack of empirical work on the effectiveness of agricultural land-use controls. The purpose of this chapter is to: (1) review the literature on agricultural land-use controls, and (2) to identify areas where this literature is incomplete. To accomplish this, the chapter is divided into two parts. In the first, nonempirical research in the field is summarized. In the second, empirical research is summarized followed by comments on suggested empirical work to provide insight into the effectiveness of agricultural land-use controls.

Nonempirical Research

Coughlin, Berry and Plaut analyze differential property tax assessment for agricultural land as a means for controlling land use. They argue that differential assessment is an indirect land-use control in that landowners are provided with an incentive to keep their land in either open space uses or in agriculture, but they are not prohibited from development. As urbanization increases, property taxes rise sharply capturing the land's speculative value. With taxes rising and income from agricultural land uses remaining relatively constant,

---

agricultural landowners face an increasing tax burden. They argue that by itself, differential assessment does not appear to be an effective tool for keeping land in agricultural use. Participants in differential assessment programs tend to be located outside areas of strong urban pressure (the rural-urban fringe), suggesting that, farmland owners in these areas have been reluctant to limit their development options. Farmers further away from the development fringe area are more likely to engage in a differential assessment program since they have less to gain. Differential assessment must complement other measures for it to be useful in keeping land in agriculture. Rollback penalties should be provided that incorporate an interest rate charge so that landowners have not received, in effect, a tax free loan on the difference between their land's speculative and current use values.

Mason\textsuperscript{10} analyzes the transfer of development rights (TDR) as a land-use control. He argues that a TDR program is an extension of zoning. An area is considered for a TDR program when it is experiencing development pressure. If such pressure exists, the area is split into a growth area and a preservation area. To further develop, landowners in the growth area must secure development rights from landowners in the preservation area. A potential problem with a TDR program is that the compensation received by owners in the preservation area is likely to be less from what they would receive in a competitive market outcome, because growth area landowners have an incentive to underestimate or underbid the value of preservation area development rights. Preserva-

tion area landowners would incur a loss of potential income. By recognizing the potential problems in setting up a market for preservation area development rights, Mason concludes that TDR programs have a definite advantage over zoning—in that limited development is permitted with at least partial compensation for those affected. Whether or not to implement such a program depends on the costs involved.

Barrows and Prenguber\textsuperscript{11} submit that traditional zoning is inadequate because the "windfall-wipeout" dilemma is created. The windfall-wipeout dilemma occurs when an area or parcel of land is zoned for an activity that would yield a lower development value for its landowner. For example, this would occur if land that is not zoned and had a market value of $15,000 per acre and then was zoned for agricultural use only. The land then may be worth only $1,500 per acre. The landowner suffers a "wipeout" loss of $13,500 per acre since the loss is uncompensated. For this reason, the authors argue that a TDR program is superior to traditional zoning.

Barrows's and Prenguber's study the problems that may be caused by development around an interstate highway exchange had a TDR program been in effect. Like Mason\textsuperscript{12} they submit that attempts to create a private development rights market are full of uncertainties. In order for this market to be created, a very sophisticated and highly trained planning agency would be called for. They conclude that TDR is a promising concept needing further empirical research.


\textsuperscript{12}Mason, "The Deregulation of Urban Land Markets: A Note on Alternatives to Zoning," pp. 54-65.
Brubaker\textsuperscript{13} reviews the issue of increasing conflicts over land use and analyzes the possibility of the conversion of noncropland to cropland uses. According to the author, the essential problem is how to accommodate changing demands on the land. Land use patterns are influenced by the physical capability of the land, economic demand for particular land uses, and preferences revealed through public policies. With physical capabilities ranking less as a determinant of overall land use, potential competition for land among uses is significant and must be resolved by economics or by policy. This suggests a hierarchy of economic demands on the land which reflects long-standing price relationships. The demand for cropland is one of these demands. To determine if cropland needs extra market protection is a question depending upon future projections of not domestic demand for agricultural products but on the future foreign demand scenarios and on physical yields.

Furuseth\textsuperscript{14} reviews and assesses Oregon's agricultural protection program, presenting a much broader analysis of agricultural land-use controls than Coughlin, et. al.\textsuperscript{15} Mason\textsuperscript{16} and Barrows, et. al.\textsuperscript{17}


\textsuperscript{15}Coughlin, "Differential Assessment of Real Property as an Incentive to Open Space Preservation and Farmland Retention," pp. 165-179.

\textsuperscript{16}Mason, "The Deregulation of Urban Land Markets: A Note on Alternatives to Zoning," pp. 54-65.

Attention is focused on, (1) the components of the Oregon farmland protection program, (2) the relative success or failure of the program, and (3) the unique characteristics or attributes which Oregon is using to keep land in agricultural use.

The Oregon legislature called on the Land Conservation and Development Commission (LCDC) to prepare and enforce a statewide land-use planning policy. On 1 January 1975, the Statewide Planning Goals became effective. Two of the planning goals directly related to agriculture. One addresses the farmland conversion issue. Embodied in this goal is an explicit state policy to protect prime and valuable agricultural land from conversion. It is required that all prime or valuable agricultural land be inventoried and placed in effective farm use (EFU) zones with large lot requirements enacted to discourage subdivision.

The other called for all municipalities to establish urban growth boundaries (UGB) to identify and separate urban land from rural areas. Furuseth believes this goal strengthens and complements state policy aimed at protecting agricultural lands. He concludes that determining if Oregon's public policy action has succeeded in reducing the quantity of prime agricultural land converted into urbanization is not possible with empirical proof lacking. Lacking empirical evidence, a second test suggested to gauge the success of the public policy action is to look at the degree of public acceptance and support for the program. With sixty-one percent of Oregonians in favor of the voting public policy action in the 1978 election, he views Oregon's program as an unqualified success.
Empirical Research

As noted in the introduction to the chapter, empirical research directed at measuring the effectiveness of agricultural land-use controls is lacking. A search of recent literature in the field found one empirical work. Furuseth\(^{18}\) updates his earlier work with the inclusion of data from *The 1978 Census of Agriculture*. While an empirical model is not specified by the author, one may infer that changes in the quantity of farmland are related to the existence of agricultural land-use controls. His contention is that there will be a direct relationship between the existence of the controls and changes in the quantity of agricultural land. That is, the existence of the controls will result in an increase in the quantity of agricultural land.

With direct agricultural land-use controls effectively implemented in Oregon in 1974, comparisons are made between changes in the quantity of agricultural land before and after 1974. Noting that for the period 1974-1978 there was an increase in land in farms of 177,809 acres, he finds that to be an encouraging indicator that Oregon's agricultural land use appears to be undergoing healthy expansion. Furthermore, agricultural land-use controls may take at least partial credit for that phenomenon.

Conclusions

In general, empirical research into the effectiveness of

agricultural land-use controls is limited to one work in the literature. Furuseth's article is a start in the right direction. It is inadequate since it fails to consider other elements that may affect changes in agricultural land use. There is a need for an empirical model to measure the effectiveness of agricultural land use controls by allowing for other elements affecting agricultural land use. Such a model is justified to demonstrate the failures or successes of the controls and to discuss the corresponding costs or benefits they impose on society. Chapter IV establishes a theoretical foundation from which an empirical model is developed in Chapter V.
CHAPTER IV
THEORETICAL MODEL

The groundwork for understanding the dynamic forces for agricultural land-use change has been outlined. It will be helpful to construct basic decision models to bring the issues into focus. The decision models are necessary to illustrate the economic reactions of consumers and producers (farmers) to changes in chosen variables that may, either directly or indirectly, affect the demand for land in agricultural or other uses. The models are a necessary theoretical foundation for the empirical analysis in Chapter V. It is assumed that consumers will seek to maximize their utility or satisfaction, and producers will seek to maximize profits. The models are limited to two sectors, agriculture and nonagriculture.

Consumer Model

The following notation is defined for the individual consumer:

1. $I$ = income constraint
2. $X_1$ = commodity one
3. $X_2$ = commodity two
4. $P_1$ = market determined price for $X_1$
5. $P_2$ = market determined price for $X_2$
6. $U$ = the consumer's utility function.

The consumer is assumed to have a direct utility function that is
"well-behaved." Utility is a function of the consumption of commodities $X_1$ and $X_2$, i.e.,

$$U = U(X_1, X_2).$$

(4.1)

The consumer will maximize utility subject to the budget constraint

$$P_1X_1 + P_2X_2 = I.$$  

(4.2)

Mathematically, the Lagrangian ($L$) expression formed is

$$L = U(X_1, X_2) + \lambda(I - P_1X_1 - P_2X_2)$$  

(4.3)

with $\lambda$ an as yet undetermined multiplier. The first order conditions are

$$\frac{\partial L}{\partial X_1} = U_1(X_1, X_2) - \lambda P_1 = 0$$

(4.4)

$$\frac{\partial L}{\partial X_2} = U_2(X_1, X_2) - \lambda P_2 = 0$$

$$\frac{\partial L}{\partial \lambda} = I - P_1X_1 - P_2X_2 = 0.$$

The equilibrium conditions are

$$\frac{U_1}{U_2} = \frac{P_1}{P_2}.$$  

(4.5)

That is, the ratio of the marginal utilities for commodities $X_1$ and $X_2$ must equal the commodity price ratio. The first two equations of (4.4) may be written as

$$\frac{U_1}{P_1} = \frac{U_2}{P_2} = \lambda.$$

Marginal utility per dollar spent must be the same for each commodity $X_1$ and $X_2$. Aggregating this model will result in a national consumer economic decision model.
The Producer Model

The following notation is defined for the producer:

1. \( P_j = \) market determined (i.e., exogenous) prices for crops \( j = 1, \ldots, n. \)
2. \( Y_i = \) inputs to crop production for inputs \( i = 1, 2, 3. \)
   with \( Y_1 = \) capital input
   \( Y_2 = \) labor input
   \( Y_3 = \) land input
3. \( r_i = \) input prices for \( Y_i. \)
4. \( q_j = \) crop production function for \( j = 1, \ldots, n. \)
   such that \( q_j = q(Y_1, Y_2, Y_3). \)
5. \( \pi = \) profits
6. \( C = \) total cost of production.

The producer is interested in maximizing profits. Profits are defined as the difference between the total revenue (TR) received for agricultural output,

\[
TR = \sum_{j=1}^{n} P_j q_j(Y_1, Y_2, Y_3),
\]

and the total cost (C) incurred in producing that output,

\[
C = \sum_{i=1}^{3} r_i Y_i.
\]

Profit maximization is, therefore,

\[
(MAX) \pi = \sum_{j=1}^{n} P_j q_j(Y_1, Y_2, Y_3) - \sum_{i=1}^{3} r_i Y_i. \tag{4.6}
\]

The first-order conditions are

\[
\frac{\partial \pi}{\partial Y_1} = P_1 f_1 - r_1 = 0
\]
\[ \frac{\partial \pi}{\partial y_2} = pf_2 - r_2 = 0 \]
\[ \frac{\partial \pi}{\partial y_3} = pf_3 - r_3 = 0. \]

The equilibrium conditions are

\[ pf_1 = r_1 \]
\[ pf_2 = r_2 \]
\[ pf_3 = r_3. \]

In equilibrium, the value of the marginal product must equal the factor input price for efficient production. As before, summing these results yields a national aggregation model.

**Implications**

These models can explain current economic trends in the land market. Figure 4.1(a) and 4.1(b) illustrate the conditions that existed for the agriculture and nonagriculture sectors in the period 1909-1914. To illustrate a point, it is assumed that the nonagricultural sector in Figure 4.1(b) is represented by housing. Since that period, per capita income, has grown steadily. An economy with increasing per capita incomes requires agriculture to undergo continuous change and adjustment. This is reflected in the income elasticity of demand for food. For example, assume for the consumer, commodity \( X_1 \) is food and commodity \( X_2 \) is housing. Assume the consumer allocates a twenty percent share \( (K_1 = 0.20) \) of income for food. Thus, the share of income being spent on \( X_2 \) is eighty percent \( (K_2 = 0.80 = 1 - K_1) \). If the income elasticity of demand for food \( (\eta_1) \) equals 0.16 (a realistic assumption for industrialized countries like the United States), the income
Figure 4.1. National economic conditions (1909-1914)
elasticity of demand for housing \((n_2)\) must be 1.2. With the income elasticity of demand for food greater than zero, an increase in per capita income will result in an increase in the amount of food demanded, assuming constant prices. With \(n_2 > n_1\) and with increasing per capita real income over time the demand for food will increase less than proportionately to the increase in demand for housing.  

This changing situation over time is shown in Figure 4.2, where the demand for housing has increased relative to that for food since the outward shift in the housing demand curve over time from \(D_H^{1909-1914}\) to \(D_H^{1983}\) in panel (b) is relatively larger than the outward shift in the food demand curve from \(D_F^{1909-1914}\) to \(D_F^{1983}\) in panel (a). This implies a declining relative demand for food. Agriculture must decline relatively because the demand growth for its output is slower than for the output of the rest of the economy. Agriculture must undergo continuous change and adjustment.

As real income rises, the relative shares will change (depending upon the income elasticities of demand) such that the rate of change of housing's expenditure share is positive while the rate of change of food's expenditure share is negative. Furthermore, as real incomes rise, \(n_1\) may decrease. This phenomenon has been observed and discussed by D. Gale Johnson (1973).  

\[19\text{This must be so for the identity, } K_1n_1 + K_2n_2 = 1, \text{ to hold.}\]

\[20\text{With the demand curves for housing and food derived from utility maximizing behavior, four properties must be satisfied; 1) additivity, 2) negativity, 3) symmetry, and 4) homogeneity.}\]


\[22\text{Ibid., pp. 91-92.}\]
Figure 4.2. National economic conditions (1983)
With rising incomes, consumers may desire greater land area with a home to maximize their utility. Agricultural land resources are strained since the demand for land in housing uses will increase relative to the demand for land in agricultural uses. With a higher relative price for housing as compared to food in Figure 4.2, \( \left( \frac{P_H'}{P_F'} > \frac{P_H}{P_F} \right) \) land resources are shifted from agricultural use to housing to capitalize on the relative price differential existing \( (P_H' - P_F') \). The consumer's new optimal commodity combination requires a shift in land usage to satisfy the higher relative demand for housing.

Population change is another primary variable affecting the demand growth for food. However, in no case can the population growth effect outweigh the effect of an income elasticity of demand for food of less than unity on the growth of food demand relative to demand growth for housing. If relative prices are constant, the growth in demand for any commodity or service can be depicted as follows: \( D = e Y + P \), where \( D \), \( Y \), and \( P \) are growth rates of quantity demanded, per capita income and population, respectively, and \( e \) is the income elasticity of demand for a particular commodity or group of commodities.\(^{23}\) If the income elasticity of demand of food is 0.16\( (e) \), \( Y \) is three percent and \( P \) is one percent, \( D \) for food is 1.48 percent. With \( Y \) equal to three percent, and the income elasticity of demand of housing equal to 1.21, \( D \) will be 4.63 percent. Even with a \( P \) of one percent, \( D \) for housing is relatively and absolutely larger than \( D \) for food.

Expectations may be incorporated into the analysis. If consumers expect current housing market prices to be substantially lower than

\(^{23}\)Johnson, World Agriculture in Disarray, p. 94.
future prices, consumers will react by shifting today's demand curve for housing to the right relative to the future demand curve for housing.

Figure 4.2 may be changed to illustrate another point. In Figure 4.3(a) and 4.3(b) are shown supply curve shifts for housing and food. Agricultural output has been greatly expanded over time mainly due to productivity gains and technological advances. Assume that cost savings in agriculture have exceeded cost savings in housing (in relative terms). This implies the supply curve for agriculture (food) shifts further to the right than the supply curve for housing. A lower price for food of $P_F^{1983}$ will result. The price differential ($P_H^{1983} - P_F^{1983}$) is greater than the price differential ($P_H^{1983} - P_F^{1983}$) before the supply curve shifts. Observing this situation, producers would convert land to capitalize on the greater price differential existing to maximize profits. With the supply of land fixed at any one point in time and a rising demand curve for land devoted to housing use, a higher price must result. These higher land input prices will be incorporated by the producer since, depending upon the particular location involved, assessed property taxes rise to reflect the higher land market values (assuming that no differential assessment program is in existence for agricultural land).

Labor inputs in agricultural production have been declining over time due to their relatively higher cost. Observation of condition (4.8) reveals that, with the price of output constant ($p$) and with $r_3$ rising, the producer must reallocate resources so as to raise the marginal product of land ($f_3$). To accomplish this, land inputs should trend downward. With declining relative land inputs, and declining labor inputs, capital inputs must increase to compensate for these effects.
Figure 4.3. Supply curve shifts, national economic conditions (1983)
Through the decision models developed earlier and the manipulation of demand and supply curves, the conclusion reached is that current economic conditions are dictating a reallocation of land among the land uses. What remains is to structure an empirical model to isolate the variables significantly responsible for land use changes.
CHAPTER V

EMPIRICAL MODEL

The literature review of Chapter III revealed the inadequate amount of attention devoted to the question of the effectiveness of state and county agricultural land-use controls. Lacking has been an overall national empirical investigation. Chapter IV employed a simplified decision model to describe possible consumer and producer economic reactions to changes in chosen variables that may affect land-use demand. With this theoretical foundation developed, the purpose of this chapter is to structure a model to test the effectiveness question. To accomplish this, two approaches will be undertaken.

In the first approach, comparisons of land-use trends are made for states and counties grouped on a "with" and "without" land-use control basis. These comparisons will be indicative, but are lacking for they fail to consider other forces that may be influencing land-use change. In the second approach, multiple regression techniques are used to test the effectiveness question while adjusting for other forces that may affect land-use trends.

Relevant state and county government agencies in the forty-eight continental United States and sixty randomly selected counties were surveyed to ascertain the initial dates of legislation (if any) passed regulating or influencing agricultural land use.24 Thirty-nine state

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24See Chapter II for an outline of the legislation.
and twenty-seven county responses were received. Aggregate data on total farmland, total cropland, and harvested cropland were analyzed (irrigated harvested cropland was excluded since data was not consistently available at the county level). For the first approach, state periods examined are 1969-1974, 1974-1978, and 1969-1978. County periods examined are more extensive since the majority of early legislation adopted has been at the county level. The county periods examined are 1959-1964, 1964-1969, 1969-1974, 1974-1978, and 1959-1978.

**Multiple Regression Model**

The model to be estimated relates changes in agricultural land to the following set of hypothesized explanatory variables; (1) changes in population, (2) changes in nonagricultural income, (3) changes in net farm income (after inventory adjustment), (4) changes in government payments, (5) a land-use control dummy variable, and (6) the ratio of agricultural land to total land. State and county data will be analyzed for the periods 1969-1974, 1974-1978, and 1969-1978. An explanation of why each hypothesized explanatory variable was included, along with its hypothesized sign, follows.

Population growth has been identified as one of the primary threats to the maintenance of the nation's agricultural land base. Growth of urban areas necessarily means expansion onto land adjacent to the urban area (or land at the urban fringe). This may occur at varying rates depending upon the existing development density in the urban area and on the desired development density in the areas to be expanded into. Sometimes, this expansion of urban activity results in the conversion of so called "prime" farmland, although, the actual extent of this has
probably been overstated. The coefficient on this variable should have a negative sign, implying an inverse relationship between population growth and changes in the quantity of agricultural land.

Higher nonagricultural incomes should result in an increase in the demand for land in nonfarm uses. With a low income elasticity of demand for agricultural products as compared to the income elasticity of demand for housing, the demand for land for farm use is expected to be negatively affected by changes in nonagricultural income because changes in population growth and changes in nonagricultural income may be highly correlated. Several variants of the regression model are estimated to deal with the possible correlation. Two equations include both variables while the other two use only one at a time. At the county level, one includes both variables while the other two use only one at a time.

Changes in net farm income are included for as net farm income rises the most likely result is an increase in the demand for land in farm use. This would be especially true if farmers believe that there will be continual future increases in income. Therefore, changes in net farm income should be positively related to changes in the demand for land in agricultural use.

Changes in government payments to farmers should result in an increase in aggregate demand for farmland. There may be some validity to excluding the variable since it already has been incorporated in net farm income. However, with respect to the extent that such payments were made to keep land out of production, its inclusion is justified and may have a negative effect on the level of harvested cropland.
A dummy variable for state and county control on agricultural use is assigned the value of "1" for observations where such controls were in effect and "0" otherwise. The hypothesized sign is positive, implying that if effective, the controls should have a positive effect on changes in agricultural land. In other words, land losses should be smaller or land gains larger for states or counties with controls than for those states or counties without controls.

The ratio of agricultural land to total land is included to capture the potential for farmland expansion. Other things equal, the lower the ratio the easier it should be to expand the farmland base, and vice versa. A negative sign on the estimated coefficient is hypothesized.

Exclusion of Relevant Variables

With the hypothesized multiple regression model specified, the problem of possible relevant variable exclusion exists. If relevant variables have been excluded, the results obtained are not as good as they could be. If too many variables are included, a higher coefficient of determination may be gained at the expense of inferior additional explanatory variables, weakening the model's overall justification. What follows is a brief discussion of why three possible relevant variables were excluded.

One possible relevant explanatory variable would be land productivity. As land productivity increases (in agricultural terms), output per unit of land will increase. This will be capitalized into higher land values if left in agricultural production. Increases in productivity would lead to an increase in the demand for land in farm use. However, a data weakness for productivity is that it is measured
in index form nationally and not at the state or county level. With respect to the model, any land productivity measure would be a constant serving no real purpose. To be truly useful, productivity figures must be available in a state index figure and a county index figure.

The ratio of the change in agricultural product prices to changes in a general price index, such as the GNP deflator, would be relevant if divisible at the state and county level. With agricultural prices increasing relative to changes in the GNP deflator, an increase in the demand for land in farm use would be expected. Farmers would be gaining in real terms (assuming they can sell all their output at the prevailing prices). Since the price ratio is essentially the same nationally, it would be a constant.

The last possible relevant explanatory variable is interest rates. Lower interest rates for farmers would result in an increase in the demand for land in farm use. With other things equal, if a farmer is faced with the decision of expanding his acreage base, lower interest rates will reduce his payments. However, since interest rates vary only slightly, it would be a constant if included in the regression.

One can no doubt think of other possible variables that may be included. However, inadequate justifications and data collection problems eliminate them from consideration. With the model specified, regression results are presented and analyzed in Chapter VI.
CHAPTER VI
RESULTS

Chapter IV established, using decision models for the consumer and producer and demand-supply curve analysis, a theoretical foundation from which to structure an empirical model. Chapter V presented the empirical model in two approaches. In the first, agricultural land-use control effectiveness was tested by measuring land-use trends for states and counties grouped on a "with" and "without" land-use control basis. The hypothesis tested is that the mean percent change in the quantity of agricultural land for the "with" control group is greater than the mean percent change for the "without" group, i.e., that agricultural land-use controls are effective. In the second, changes in the quantity of agricultural land were hypothesized to be a function of several explanatory variables structured in a multiple regression model. Tables 3, 4, and 5 summarize the results from the first approach. Tables 5 through 12 summarize the results from the multiple regression model.

First Approach

State Results

In Table 3, there are nine relevant state comparisons made for the three time periods and for the three land categories.\(^25\) The aggregate

\(^{25}\)Clearly, total cropland is probably the most important of the three categories.
### TABLE 3

**COMPARISON OF AGGREGATE AND AVERAGE CHANGES IN FARMLAND BY TYPE AND STATE WITH AND WITHOUT LAND-USE CONTROLS; 1969-74, 1974-78, AND 1969-78 (ACREAGE IN 1000'S)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Controls</td>
<td>No Controls</td>
<td>Controls</td>
</tr>
<tr>
<td><strong>Total Farmland</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acreage—initial year</td>
<td>137,733</td>
<td>771,695</td>
<td>167,939</td>
</tr>
<tr>
<td>Acreage—Terminal year</td>
<td>132,037</td>
<td>741,335</td>
<td>168,474</td>
</tr>
<tr>
<td>Change</td>
<td>-5,696</td>
<td>-30,360</td>
<td>535</td>
</tr>
<tr>
<td>Percentage change</td>
<td>-4.14</td>
<td>-5.93</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>Average percentage change</strong></td>
<td>-5.91</td>
<td>-6.98</td>
<td>2.07</td>
</tr>
<tr>
<td><strong>Standard deviation</strong></td>
<td>4.40</td>
<td>5.79</td>
<td>3.16</td>
</tr>
<tr>
<td><em>t</em> statistic</td>
<td>0.55</td>
<td>-1.07</td>
<td></td>
</tr>
<tr>
<td><strong>Total Cropland</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acreage—initial year</td>
<td>64,501</td>
<td>329,873</td>
<td>71,774</td>
</tr>
<tr>
<td>Acreage—Terminal year</td>
<td>61,261</td>
<td>317,050</td>
<td>75,047</td>
</tr>
<tr>
<td>Change</td>
<td>-3,240</td>
<td>-12,823</td>
<td>3,273</td>
</tr>
<tr>
<td>Percentage change</td>
<td>-5.02</td>
<td>-3.89</td>
<td>4.56</td>
</tr>
<tr>
<td><strong>Average percentage change</strong></td>
<td>-4.59</td>
<td>-5.04</td>
<td>7.99</td>
</tr>
<tr>
<td><strong>Standard deviation</strong></td>
<td>1.97</td>
<td>3.48</td>
<td>6.59</td>
</tr>
<tr>
<td><em>t</em> statistic</td>
<td>0.93</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td><strong>Harvested Cropland</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acreage—initial year</td>
<td>38,460</td>
<td>198,758</td>
<td>48,208</td>
</tr>
<tr>
<td>Acreage—Terminal year</td>
<td>42,251</td>
<td>213,952</td>
<td>49,320</td>
</tr>
<tr>
<td>Change</td>
<td>3,791</td>
<td>15,194</td>
<td>1,112</td>
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<tr>
<td>Percentage change</td>
<td>9.66</td>
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<td>2.31</td>
</tr>
<tr>
<td><strong>Average percentage change</strong></td>
<td>7.12</td>
<td>7.04</td>
<td>7.04</td>
</tr>
<tr>
<td><strong>Standard deviation</strong></td>
<td>4.24</td>
<td>7.43</td>
<td>7.88</td>
</tr>
<tr>
<td><em>t</em> statistic</td>
<td>-0.33</td>
<td>-0.54</td>
<td></td>
</tr>
</tbody>
</table>

*a* In 1969, of the thirty-nine states surveyed, there were seven states with controls on the use of agricultural land.

*b* In 1974, of the thirty-nine states surveyed, there were eight with controls on the use of agricultural land.

*c* Based on the seven states with controls in 1969.
### Table 4

Comparison of aggregate and average changes in farmland by type and county with and without land-use controls; 1969–74, 1974–78, and 1969–78 (acreage in 1000's)

<table>
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<sup>a</sup>In 1969, of the twenty-seven counties surveyed, there were nine counties with controls on the use of agricultural land.

<sup>b</sup>In 1974, of the twenty-seven counties surveyed, there were fourteen counties with controls on the use of agricultural land.

<sup>c</sup>Based on the nine counties with controls in 1969.
TABLE 5

COMPARISON OF AGGREGATE AND AVERAGE CHANGES IN FARMLAND BY TYPE AND COUNTY WITH AND WITHOUT LAND-USE CONTROLS; 1959-64, 1964-69, AND 1959-78. (ACREAGE IN 1000'S)

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<th>1959-1978&lt;sup&gt;c&lt;/sup&gt;</th>
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<sup>a</sup>In 1959, of the twenty-seven counties surveyed, there were five counties with controls on the use of agricultural land.

<sup>b</sup>In 1964, of the twenty-seven counties surveyed, there were seven counties with controls on the use of agricultural land.

<sup>c</sup>Based on the five counties with controls in 1959.

NOTE: Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
## Table 6

**SUMMARY OF ESTIMATED STATE REGRESSION EQUATIONS**

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<th>Δ Population</th>
<th>Δ Nonagricultural Income</th>
<th>Δ Net Farm Income</th>
<th>Δ Government Payments</th>
<th>Land Control Dummy</th>
<th>Land Ratio</th>
<th>R²</th>
<th>F</th>
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**NOTE:** *t* statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
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<th>Population</th>
<th>Δ Nonagricultural Income</th>
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NOTE: "t" statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
### Table 8

**Summary of Estimated State Regression Equations**

Dependent Variable: Δ Harvested Cropland

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<th>Eq. Period</th>
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<th>Δ Net Farm Income</th>
<th>Δ Government Payments</th>
<th>Δ Land Control Dummy</th>
<th>Δ Land Ratio</th>
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**Note:** "***" statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
### TABLE 9

**SUMMARY OF ESTIMATED STATE REGRESSION RESULTS**

Excluded Variable: Δ Government Payments  
Dependent Variables: Δ Total Farmland [Equations (1)-(3)]; Δ Total Cropland [Equations (4)-(6)]; and Δ Harvested Cropland [Equations (7)-(9)]

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<th>Δ Farm Income</th>
<th>Land Control Dummy</th>
<th>Land Ratio</th>
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**NOTE:** ***statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
**TABLE 10**

**SUMMARY OF ESTIMATED REGRESSION EQUATIONS (COUNTY DATA)**

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<th>Eq.</th>
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<th>Population</th>
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<th>Δ Farm Income</th>
<th>Land Control Dummy</th>
<th>Land Ratio</th>
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**NOTE:** "*" statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
## TABLE 11

**SUMMARY OF ESTIMATED REGRESSION EQUATIONS (COUNTY DATA)**

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<th>Eq.</th>
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<th>Δ Population</th>
<th>Δ Nonagricultural Income</th>
<th>Δ Farm Income</th>
<th>Land Control Dummy</th>
<th>Land Ratio</th>
<th>R²</th>
<th>F</th>
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<td>-</td>
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**NOTE:** "t" statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
## TABLE 12

### SUMMARY OF ESTIMATED REGRESSION EQUATIONS (COUNTY DATA)

Dependent Variable: \( \Delta \) Harvested Cropland

<table>
<thead>
<tr>
<th>Eq.</th>
<th>Period</th>
<th>Constant</th>
<th>( \Delta ) Population</th>
<th>( \Delta ) Nonagricultural Income</th>
<th>( \Delta ) Net Farm Income</th>
<th>Land Control Dummy</th>
<th>Land Ratio</th>
<th>( R^2 )</th>
<th>( F )</th>
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<td>(1)</td>
<td>1969-1974</td>
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<td>-0.003307</td>
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<td>0.3958***</td>
<td>8.0605</td>
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<tr>
<td>(6)</td>
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<td>(8)</td>
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<td>---</td>
<td>0.4649***</td>
<td>8.4385</td>
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<td>(0.4084)</td>
<td>(1.5817)</td>
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</tbody>
</table>

**NOTE:** "*" statistics are shown in parentheses below the estimated coefficients. Superscripts *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.
data above the dashed line in each part of the table is less meaningful because of the considerable differences in the size of agricultural areas among the states. The key data reported is the average percent change for the states in each category. This is shown below the dashed line in each part of the table, as are the standard deviations and "t" statistics for testing for significant differences between the "with" control and "without" control means.

Examining the "t" statistics reveals that four of the differences have the wrong sign under the null hypothesis. None of the differences are significant at either the 0.10, 0.05, or 0.01 probability levels. Only one comparison is marginally significant and that is the comparison for total farmland during the 1974-1978 period. The mean percent change for the "with" control group is 1.07 standard deviations below the mean percent change for the "without" control group. This difference is significant at the 0.15 level, but the sign does not agree with the hypothesized sign. The evidence presented in Table 3 is, at best, mixed concerning the effectiveness of state agricultural land-use controls.

**County Results**

In Table 4 and Table 5, there are nine relevant comparisons made for the three time periods and for the three land categories. Table 4 analyzes county agricultural land-use control effectiveness corresponding to the time periods of Table 3. One "t" statistic has the wrong sign. This is for harvested cropland for the 1974-1978 period. The results of Table 4 are more meaningful than the results of Table 3 because Table 3 does not consider the possibility that while a state may not have control legislation, county or other local government units
might. Such local laws may be affecting land resource allocation, but they are not being accounted for at the state level.

Table 5 presents data for three additional time periods not available at the state level. In contrast to Table 3 and Table 4, all of the "t" statistics have the correct sign under the null hypothesis. Two of the differences are significant at the 0.01 level. These are for total farmland and total cropland for the 1959-1978 period. Three of the differences are significant at the 0.05 level. These are for harvested cropland for the 1959-1978 period and for total farmland and harvested cropland for the 1964-1969 period. One difference is significant at the 0.10 level. This is for total farmland during the 1959-1964 period. Of greater importance is that in each category and time period the average positive percent change in the quantity of agricultural land for the "with" control group exceeds that of the "without" control group. Furthermore, the average negative percent change for the "with" control group is less than that of the "without" control group. With six of nine "t" statistics significant at a minimum probability level of 0.10 and favorable average percent changes in the quantity of agricultural land for the "with" control group, agricultural land-use controls appear, for the most part, to be effective for the time periods specified. However, when looking at a long time period (1959-1978), structural changes, such as those taking place in agriculture in the 1970's, may go unnoticed. To capture the structural changes, subperiods are analyzed. While statistically of greater importance, Table 5 is less meaningful than Table 3 or Table 4 since the time periods analyzed do not allow for structural change.
To relate changes in the quantity of agricultural land solely to the existence of agricultural land-use controls is lacking since other factors may come into play. Chapter V outlined a multiple regression model to describe changes in the quantity of agricultural land as a function of several hypothesized explanatory variables. Results from that model are discussed below.

Multiple Regression Results

State Results

The first approach explained changes in the quantity of total farmland, total cropland, and total harvested cropland as a function of the existence of agricultural land-use controls. This approach was limited for it failed to consider other variables possibly influencing agricultural land use. Results from the multiple regression model are summarized in Tables 6 through 12. State regression results are summarized in Tables 6 through 9, while county regression results are summarized in Table 10 through 12. Results pertaining to total cropland are discussed for they are more important to the controversy surrounding agricultural land conversion and land-use controls than total farmland or harvested cropland (since the major extent of concern surrounding agricultural land is centered on losses from the cropland base).

Table 7 summarizes state regression results where the dependent variable is the change in total cropland. Equations (1) through (3) analyze data for the period 1969-1974. In equation (1), changes in population is excluded as a possible explanatory variable due to possible multicollinearity with nonagricultural income. The "t" statistics for changes in nonagricultural income, changes in net farm
income, and the land-control dummy variable were not statistically significant. The estimated coefficient on changes in nonagricultural income (-0.0003) implies that for every one million dollar increase or decrease in nonagricultural income, total cropland will decrease or increase by 0.3 acres. The estimated coefficient on net farm income says that for every one million dollar increase in net farm income, total cropland will increase by thirteen acres.

The \( t \) statistics for government payments and the land ratio are significant at the 0.01 and 0.05 levels, respectively. The estimated coefficient on government payments and the land ratio implies that for every one million dollar increase in government payments or a change in the land ratio of one-tenth of one percent, total farmland will increase by seven hundred and twenty-nine acres or 888.7 acres, respectively. In equation (2), the results are not significantly changed by including changes in population and excluding changes in nonagricultural income as an explanatory variable. The estimated coefficient for changes in population implies that for every one thousand increase in population, total cropland will increase by two hundred and eleven acres. This is opposite to the hypothesized sign on the estimated coefficient. With changes in population and changes in nonagricultural income included in Equation (3), again the results are not significantly different. For the period 1969-1974, changes in government payments and the land ratio statistically best explain changes in the quantity of total cropland.

Different results are obtained for the 1974-1978 period. With changes in population excluded in equation (4), changes in nonagricultural income, changes in net farm income, changes in government payments, the land-use control dummy, and the land ratio are
statistically significant at the 0.01, 0.01, 0.01, 0.05, and 0.10 levels, respectively. The signs on changes in nonagricultural income and the land-use control dummy are wrong under the hypothesis. The estimated coefficient for changes in nonagricultural income suggest that for every one million dollar increase in nonagricultural income, total cropland will increase by thirty-eight acres. Equation (5) excludes changes in nonagricultural income and includes changes in population as an explanatory variable. The sign on changes in population does not agree with the hypothesized sign, implying that for every one thousand increase in population, total cropland will increase by 995 acres. Changes in population and changes in nonagricultural income are included as explanatory variables in Equation (6). For the two periods 1969-1974 and 1974-1978, the percentage of total variation in the dependent variable explained by the independent variables (R-square) ranges from 0.56 to 0.73 and the related F statistics are all significant at the 0.01 or lower probability levels.

The equations for the 1969-1978 period explain much less (the values of R-square range from 0.30 to 0.32). Presumably, the structural changes that occurred in agriculture in the early 1970's result in poor statistical results when estimating equations for the entire period. Fortunately, the dates of the Census of Agriculture correspond roughly with this structural change. The use of the periods 1969-1974 and 1974-1978 dictated by the availability of data make some sense given the changes that occurred about 1973-1974.

The coefficients on the land-use control dummy variable are consistently negative and are statistically significant only in
equations (4) and (6) for the 1974-1978 period.\textsuperscript{26} Using these point estimates as the best available, one could infer that in the "typical" state, the existence of land-use controls resulted in a reduction in the cropland base of some 160-175 thousand acres during the 1969-1974 period and 200-410 thousand acres during the 1974-1978 period. Of course, this is inconsistent with the hypothesis. The explanation for this may be that the model is misspecified. Rather than land-use controls affecting the rate of land conversion, the reverse may be true. The following county regression results may provide additional insights.

\textbf{County Results}

Table 11 summarizes county regression results where the dependent variable is the change in total cropland. For the 1969-1974 period, the only "t" statistic of significance is for changes in net farm income at the 0.01 probability level. For equations (1) and (3), the sign on changes in nonagricultural income disagrees with the hypothesized sign. In equation (1), the estimated coefficient for changes in nonagricultural income implies for every one million dollar increase in nonagricultural income for the period total cropland will increase by approximately 3.6 acres. The sign on changes in net farm income in equation (1), (2), and (3) is incorrect. An incorrect sign in equation (1) implies that for every one million dollar increase in net farm income, total cropland will decline by two hundred and fifty-one acres.

For the 1974-1978 period, the sign on changes in population and changes in nonagricultural income agree with their hypothesized signs.

\textsuperscript{26}In the equations for total farmland and harvested cropland in Table 6 and Table 8, the signs of the coefficients are also predominantly negative, although most are not significant.
For the two periods 1969-1974 and 1974-1978, R-squares range from 0.27 to 0.46 (below that for the state data of Table 7), and the related F statistics are significant at the 0.01 probability level in equations (1), and (2), and the 0.05 level in equation (3).

The equations for the 1969-1978 period, like those of Table 7, explain much less (the values of the R-square range from 0.05 to 0.06). For the period, none of the "t" statistics are significant. The structural changes that occurred in agriculture in the early 1970's resulted in poor statistical results when estimating equations for the entire period for both county and state data. This is more apparent, at least from examining equation (7), (8), and (9), at the county level.

The coefficients on the land-use control dummy variable are consistently negative for the 1969-1974 period, but statistically insignificant, are positive for the 1974-1978 period and are significant at the 0.05 probability level. For the "typical" county, one may infer that the existence of land-use controls resulted in a reduction in the total cropland base of some 5,700-5,900 acres during the 1969-1974 period and an increase in the cropland base of some 20-24 thousand acres during the 1974-1978 period.

The results analyzed so far do not clearly point to either the effectiveness or ineffectiveness of land-use controls. In Table (5), (7), (8), and (9) for state data, the "t" statistics for the land-use control dummy are significant for nine of twelve equations covered in the period 1974-1978. In each case the sign is opposite to the expected sign while the R-squares are poor for every category except for changes in total cropland. At the state level, land-use controls have been ineffective. In Table (10), (11), and (12), the land-use control
dummy variable has the correct sign in the 1974-1978 period for all land categories. The "t" statistics for that period are all significant at a minimum 0.10 probability level. However, the R-squares are poor in ranging from 0.15 to 0.30. For the 1969-1974 period, the sign is wrong on the land-use control dummy for total farmland and total cropland while it is correct but statistically insignificant for total harvested cropland. The R-squares for the 1969-1974 period suggest that the model better explains changes in the quantity of agricultural land than for the 1974-1978 period. At the county level, land-use controls are statistically effective in the 1974-1978 period, however, the overall model is weak. The remaining task is to summarize the overall results obtained and the thesis in Chapter VII.
CHAPTER VII
CONCLUSIONS

The thesis is primarily concerned with the effectiveness of agricultural land-use controls embodied in the land-use control dummy variable. To accomplish this, changes in the quantity of total farmland, total cropland, and total harvested cropland (a subset of total cropland) have been hypothesized to be explained as a function of changes in nonagricultural income, changes in net farm income, changes in population, changes in government payments, the ratio of agricultural land to total land area (the land ratio), and the land-use control dummy. If controls have been effective, the sign on the land-use control dummy should be positive and be statistically significant, at least at a minimum 0.10 probability level.

At the state level, the regression analysis offers little support for or argument against the notion that agricultural land-use controls are effective. Generally, the coefficients on the land-use control dummy are negative, and where they are positive, they are not significant. Those who support such measures will not be pleased with these results. The empirical results simply strengthen the theoretical arguments against land-use controls presented in Chapter I. Those who view such interference in the land market as potentially damaging may take some comfort. One drawback to the state only approach is that it does not take into account the possibility of existing county
legislation. A county analysis, therefore, is required.

At the county level, the regression analysis offers some support that agricultural land-use controls are effective. This is for the period 1974-1978 for total cropland and total harvested cropland. Those who support such measures will be encouraged with these results. Those who oppose such interference in the land market will not be.

If viewed from the state level, the resource cost involved in passing the agricultural land-use control legislation and administering it, even though it is ineffective, may not be trivial. Costs are therefore imposed upon society even though the controls are ineffective, and they are not significantly influencing land allocation. However, the marginal cost of this legislation is probably small relative to the misallocation costs imposed if the laws were effective.

At the county level with the controls being somewhat effective, this stands in contrast to the theoretical conclusions reached in Chapter I. By not allowing society to freely determine the amount of land to be allocated among the different land-use categories, society is not able to maximize its welfare. Therefore, the controls are effectively influencing land allocation but not necessarily suiting society's best interest.

In conclusion, there is little if any economic justification for agricultural land-use control legislation. The evidence for agricultural land-use controls is very limited. If anything, the current situation may be optimal. Advocates of land-use controls have all the legislation they want and are satisfied that agricultural resources are being protected while at the same time the market is still free to allocate land resources efficiently (for the most part) since
the controls are not effectively influencing land allocation. Ineffective laws may increase welfare if the marginal benefits that advocates of land-use control legislation and the marginal benefits of individuals comforted with the fact that the market is efficiently allocating land, exceed the marginal costs (or administrative costs) incurred in passing the legislation. If the controls were effective, society's welfare would be decreased when the marginal costs of an inefficient land allocation, brought about by the land-use controls, are accounted for. Given the importance of the issue, only those arguments based on scientific reasoning and solid empirical analysis concerning agricultural land-use controls, should be entertained since the purpose of any investigation should be to present the truth.
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APPENDIX

This appendix presents a brief summary of direct and indirect agricultural land-use controls for each state that responded to information requests. Thirty-nine of forty-eight states responded.

Alabama

The State of Alabama has no laws regulating land uses at the state level.

California

The California Land Conservation Act of 1965 (otherwise known as the Williamson Act) brought the state into the area of land-use control regulation. The act made clear that the preservation of a maximum amount of the limited supply of agricultural land is necessary to the conservation of the state's economic resources. The act calls for the state to discourage premature and unnecessary conversion of agricultural lands to urban uses, recognizing that in a rapidly urbanizing state placing conversion pressure on its agricultural lands, those agricultural lands have a definite public value as open space.

Under article 2.5 of the Williamson Act, beginning on 1 January 1971, any county or city having a general plan may establish agricultural preserves. The preserves usually will have a minimum size of one hundred acres, but this requirement may be lowered depending upon the unique characteristics of the agricultural enterprises in the area.
The county or city that starts a preserve may by contract limit the use of the land for the purpose of preserving it for agricultural use. Owners of land in the preserve are not required to sign the contract. If they do, the length of each contract shall be for a term of no less than ten years. If a landowner seeks to cancel a contract, the landowner must seek board approval.

The Open Space Easement Act of 1974 brought together with agricultural land, other types of land to promote the preservation of open space land. To promote the conservation, preservation and continued existence of open space lands, the lands brought in are to be valued for restrictions and current uses.

An inventory of prime agricultural land resources must be prepared by the State Office of Planning and Research. This will allow the state to estimate the amount of prime agricultural land resources that must be preserved to maintain the agricultural economy of the state and to assure adequate and healthful food for future residents of the state and nation.

Article 4 of the act stipulated that by 31 December 1973, every city and county shall prepare and adopt an open-space zoning ordinance consistent with the local open-space zoning ordinance that each city and county has formulated.

**Colorado**

Differential assessment was the first state land-use control legislation. Adopted in 1964, the particular statute provides that agricultural land shall be valued (exclusive of improvements) at a rate of 11.5% of its productive capacity. To be assessed as agricultural
land, the land must meet the following requirements: 1) have been used
the previous two years and presently for monetary profit through
agricultural activities; 2) or be in the process of being restored
through conservation practices including resting, deferred grazing, or
fallowing; 3) and the land must have been classified as eligible for
classification as agricultural land during the 10 years preceding the
year of assessment; and 4) the land must continue to have an
agricultural use.27

The Local Government Land-Use Control Enabling Act of 1974 gave
local governments (cities and towns) broadened power to regulate
development. This additional authority was provided so that local
governments could protect environmentally unstable areas and to regulate
land use on the basis of its impact upon the community and the
surrounding areas. In 1975, cities, towns, and counties were authorized
by the state to adopt and regulate land uses through zoning.

Connecticut

In 1963, Public Act 490 was passed by the legislature. The act
declares that it is in the public interest to encourage the preservation
of farm land so that a readily available source of food and farm
products can be maintained close to the states metropolitan areas and to
prevent the forced conversion of farm land to more intensive uses as a
result of economic pressures caused by farmland property tax assessments
at values incompatible with the preservation of the farmland.

The act provides for the assessment of farm, forest, and open space

27Colorado, Department of Agriculture, Inventory of Existing
at its use value rather than its current market value. Public Act 152 imposed a percentage fine on agricultural land, held under Public Act 490, whose use is changed. The tax ranges from ten percent of the sales price if the land is sold during the first year of acquisition or classification, whichever is earlier, declining one percentage point each subsequent year until no conveyance tax is imposed if the land remains open following the end of the tenth year of Public Act 490 classification or ownership whichever is earlier.28

Delaware

Delaware's Conservation Easement Law was enacted in July, 1978. The law placed limitations, in the form of restrictions, easements, covenants, or by other instruments, on land uses and on the changes that could take place for the purpose of protecting land or water areas predominantly in their natural, scenic, recreational, or open condition in agricultural, farming, forest, or open-space uses. More recently, the Delaware Agricultural Lands Preservation Act of 1981 has been enacted. Under this act, state policy will be to conserve, protect, and enhance the agricultural economic base of the state for the production of food, fiber, and fuel. The Delaware Department of Agriculture, in cooperation with the Office of Management, Budget, and Planning, must review data on the extent of farmland losses. Policies and techniques must be recommended by the two agencies to the governor to maintain agriculture as an important and viable economic activity.

Florida

Florida has several statutes to slow the conversion of agricultural county land to other uses. Section 193.461 Florida statutes (The "Greenbelt Law" enacted on 1 July 1959) calls for the property appraiser(s) to classify all lands in the county for assessment purposes as either agricultural or nonagricultural. Land use will determine the tax rate, with agricultural use receiving a lower tax rate than nonagricultural uses. The latest legislation is the "Right to Farm Law" (Section 823.14 Florida Statutes). This nuisance law (enacted 16 May 1979) states that a person moving next to an established farming operation has no right to complain about noise, odors, etc. generated by the workings of the agricultural operation unless it is injurious to public health and safety.

Georgia

Senate Bill 348 passed in the 1980 session of the Georgia General Assembly represents the state's only legislation pertaining to the preservation of agricultural land. The law states that if the agricultural land in question was being farmed prior to the establishment of the surrounding nonagricultural uses, the agricultural operation is not to be considered a nuisance.

Illinois

The state's legislative response to farm land conversion is embodied in two pieces of legislation. Public Act 81-1173 (The Agricultural Areas Conservation and Protection Act) took effect on 1 July 1980. The act provides for the establishment of agricultural and protection areas. A county board may establish a county Agricultural
Areas Committee whenever a petition is received by the county board for the creation of an agricultural area. Any owner or owners of land may submit a proposal to the county board calling for the creation of an agricultural area within the county. An agricultural area at its creation, shall not be smaller than five-hundred acres, with the territory as compact and contiguous as is possible. Participation in an area is voluntary with an initial time length of ten years.

When any part of a proposed agricultural area is within a 1-1/2 mile radius of the corporate limits to a municipality, the county board must notify the proper authorities in the municipality. If the municipality objects to the encroachment of the agricultural area within the 1-1/2 mile corporate limit radius, the proposed area shall be modified to exclude all area real estate from within the radius. Once in an agricultural area, an owner is not absolutely required to stay in for the full time. They may petition the county board for early withdrawal provided that the county board is convinced by the owner's pre-withdrawal argument. There exists no penalty for withdrawal from the area. If all owners no longer desire to be included in the agricultural area after the initial ten years, they may petition the county board to dissolve the area. Public Act 82-509 (November, 1981) recognizes that, "It is the declared policy of the state to conserve and protect and encourage the development and improvement of its agricultural land for the production of food and other agricultural products."29 The Act is essentially a nuisance law stating that no

29Illinois, Department of Agriculture, Bureau of Farmland Protection, Division of Natural Resources, Public Act 82-509 (1982).
farm, nor any of its appurtenances, shall be deemed a nuisance if the farm was considered not a nuisance at the time its operations began and has been in operation at the same site for more than one year regardless of any changed conditions in the surrounding area.

**Indiana**

Only recently (1981) the state passed a law with respect to agriculture. The law is designed to limit the circumstances under which agricultural operations may be deemed nuisance. An amendment to the 1981 act was added during the 1982 legislative session, specifying that for an agricultural operation not to be deemed a nuisance, it must have been continuously in operation for at least one year on the locality. During that one year, there must not have been any significant change in either the hours of operation or in the types of operation. The operation must also not have been considered a nuisance at the time it began its operations on that locality.

**Iowa**

Iowa does not have state legislation aimed at preserving agricultural land. The state legislature is considering legislation.

**Kansas**

At present there is no statewide policy concerning agricultural land-use regulation. There are several laws that may indirectly affect agricultural land use. K.S.A. 19-2927 (1951) allows counties that have either a first, second, or third class city located therein to impose zoning regulations within any unincorporated territory lying within three miles of any such city to promote public health and safety and to
conserve and protect property and building values. K.S.A. 19-2929 (1951) allows county commissioners the right to divide unincorporated territory into districts to carry out the purposes of K.S.A. 19-2927 and to regulate and restrict the construction, modification, or use of buildings, structures, or land.

Maine

The Farm and Open Space Tax Law of 1975 represents Maine's agricultural land preservation legislation. The law provides for the valuation of land classified as farmland or open space land based on its current use as farmland or open space, rather than its potential fair market value for more intensive uses other than agricultural or open space. Penalties will be assessed for any land-use changes disqualifying land from the lower tax rate classification.

Maryland

Planning and zoning enabling legislation was adopted in 1950. It provided for local government autonomy in planning and zoning (conferred police powers). Agricultural use property tax assessment was adopted by the state in 1959. In addition, this differential use tax was the first of its kind to be established in the nation. Statewide property tax credits for preservation land were adopted in 1976. Voluntary agricultural districting was initiated in the Maryland Agricultural Land Preservation Program in 1977. State legislative action in 1980 resulted in the adoption of a transfer of development rights program.

Massachusetts

The state acted in 1973 by signing into law legislation aimed at
retaining a significant farmland base. The Farmland Assessment Act of 1973 was designed to remove some of the pressure to sell farmland for non-farm uses by permitting actively farmed land to be assessed and taxed on its farm use value rather than its potential development value. In 1977, the Agricultural Preservation Restriction (APR) Act was legislated to offer protection for farmland in the Commonwealth. To be eligible, agricultural land lots (1) must be at least five acres in size, (2) have produced at least $100 per acre gross sales annually on that acreage, and (3) have been in farming for the two consecutive years prior to application. It provides farmland owners the opportunity to realize the value of the "development rights" of their property.\(^{30}\) The farmer capitalizes on the difference between the agricultural and non-agricultural development values by agreeing to place a permanent restriction on his land prohibiting all non-farm development and allowing only for agricultural uses. Participation in the program is voluntary.

**Minnesota**

The state has enacted legislation addressing the financial hardships faced by farmers by placing constraints on agricultural land use. In 1976, the Family Farm Security Act was approved to help normally ineligible farmers obtain credit to purchase farm real estate by guaranteeing loans and differing interest payments. Eligibility requirements are numerous.

To preserve land in agricultural use in the seven-county Twin

\(^{30}\text{Massachusetts, Department of Food and Agriculture, Saving Farmland in Massachusetts (1982).}\)
Cities Metropolitan Area the, Metropolitan Agricultural Preserves Act was enacted in 1980. Participation is voluntary and the program is administered by local governments which are required to plan and zone the land for agricultural use. The farmer-landowner may apply to have his or her land placed into an agricultural preserve upon completion of the planning and zoning phase by local government. The farmer-landowner agrees, by written covenant, to keep land in agricultural use indefinitely for a minimum of eight years. Leaving the program is the result of one of two actions. Either the local authority has changed the planning and zoning of land, thus, making it ineligible to stay in a result of a farmer-landowner's desire to get out of the program. In the program or as either case, the land remains in an agricultural preserve for at least eight more years from the date that it is removed from the program. There then follows a two-year period in which the farmer-landowner may reverse their decision. The act goes on to impose property taxes on agricultural land based on the land's appropriate agricultural classification and value (differential assessment).

Right-to-farm legislation becomes effective on 1 January 1983. In 1982, the Agricultural Land Preservation Act was enacted, stipulating that state policy is to preserve land in agriculture and conserve its long-term use for the production of food and other agricultural products. This is to be accomplished by protecting agricultural and other certain parcels of open space land from conversion, conserving, and enhancing soil and water resources to ensure their long-term quality and productivity, encouraging the planned growth and development of urban and rural areas and by pushing for the ownership and operation of agricultural land by resident farmers.
Missouri

No laws exist directly regulating or restricting the uses of agricultural land. Two items are being considered by the Missouri Legislature. House Bill No. 1447 is an act establishing voluntary agricultural districting within the state. Any owner(s) of land may submit a proposal to the governing body of any county for the creation of an agricultural district, the main purpose of which is to protect viable farmland. When considering the formation of an agricultural district, the county governing board must consider factors such as county development patterns and needs before arriving at a decision. The minimum size of a district will be one thousand acres with ten years as the initial time length for the contract. Land within the agricultural district must be used for agricultural production only, with few exceptions allowed. Senate Bill No. 537 is an act designed to protect agricultural operations from nuisance suits under certain circumstances.

Montana

The state of Montana does not have regulations directly relating to agricultural land use. Possible indirect legislation is contained in regulations indirectly relating to agricultural land use in the Montana code annotated Title 76 relating to soil and water conservation. Section 76-15-701 concerns the adoption of land-use regulations by stating that the supervisors of any soil or water conservation district will have the authority to formulate regulations governing land use within the district in the interest of 1) conserving soil and water resources, and 2) preventing and controlling erosion.
Possible future legislation is embodied in the Montana Conservation Districts Division (CDD) Resource Conservation Plan, 1981-1985. Changes in land use are discussed in two objectives. Objective A calls for the provision of local level incentives to keep productive land in production. The Montana CDD will assist interested conservation districts with the development of agricultural preserve programs. Objective B calls for the CDD to increase support for the preservation of prime agricultural land. To accomplish this, the CDD will encourage conservation districts to incorporate agricultural land preservation programs in their education and information programs. This is meant to aid farm and ranch organizations and real estate agencies desiring agricultural land preservation.

Nebraska

There are no laws dealing with agricultural land-use regulation at the state level.

Nevada

Legislation (NRS 361A) aimed at assisting agriculture was adopted by the Nevada Legislature in July, 1975. NRS 361A allows for reduced real property assessments for land devoted and maintained in agricultural use. The original intent of the law and constitutional amendment was to provide an alternative to owners of agricultural and open-space land in urbanizing areas. Land could be retained in agricultural or open-space use instead of bowing in to urban development.

\[31\text{Nevada, Department of Agriculture, Analysis of Nevada's Agricultural Tax Deferral Program (1982) NRS Chapter 361A.}\]
pressure caused by high property taxes based on the land's potential market value.

**New Hampshire**

The State of New Hampshire has no regulations or laws favoring agricultural land use. Several communities have adopted zoning ordinances to deal with agricultural land use.

**New Jersey**

The state does not have any legislation relating to agricultural land preservation. Most legislation is embodied at the municipality level. Two bills are currently pending in the state legislature. The first is Senate bill No. 3233 introduced on 14 May 1981. This bill would authorize the creation of a state debt by the issuance of bonds in the sum of $50,000,000.00 for the purchase of development easements on farmland and to provide state matching funds for soil and water conservation projects. Senate Bill No. 3479 concerns agricultural development and farmland preservation. The bill establishes the state agriculture development committee and provides for the establishment of county agriculture development boards which would provide for the establishment of voluntary agricultural districts.

On 31 October 1980, a state study was released forwarding proposals for agricultural land retention and a development program in the state. The study recommended that a series of actions be taken to solidify the agricultural land base and the farming industry in New Jersey. These actions are to provide for 1) a state and local commitment to agriculture by providing encouragement and assistance, 2) voluntary participation in limited term agriculture districts, 3) local
implementation of land planning techniques, 4) compensation for development rights given up permanently, and 5) an interlocking series of activities that would provide for a system of checks and balances to maximize the potential for the future of farming in New Jersey.

New Mexico

Recently, the state enacted into law legislation dealing with the issue of agricultural land preservation. In 1981, the state legislature passed a right-to-farm bill (Senate Bill 408), the purpose of which is to conserve, protect, encourage, develop, and improve agricultural land for the production of agricultural commodities and to reduce losses from the state's agricultural resources by stipulating under what conditions agricultural operations may be deemed a nuisance.

New York

State agricultural land-use legislation came into existence in 1971, with the Agricultural Districts Law. That law stipulates it is the declared policy of the state to conserve, protect, and to encourage the development and improvement of its agricultural lands for the production of food and other agricultural products. Typical contract length for a district is eight years. Every eight years, the agricultural district must be reviewed, and if strong demand exists for non-farm uses, the district may be reduced in size or eliminated. Lower use value assessments associated with agricultural land use are available to farmers by keeping their land in agricultural production. Farmers not located in the original agricultural district are also eligible for tax relief through differential use value assessment. These farmers sign a commitment stipulating that they will remain in farming for
eight years. Tax penalties are to be imposed upon farmers desiring withdrawal from the agricultural districts.

**North Dakota**

No state level legislation regulating the use of agricultural land exists currently. Several counties do, however, have some zoning.

**Ohio**

The Current Agricultural Use Valuation (CAUV) Act became effective on 26 July 1974, with rules effective beginning with the 1975 tax year. Under CAUV, landowners may have their land assessed at its use value for agricultural purposes rather than the current market value. Recent legislation has greatly expanded the extent of agricultural land-use controls and regulations. Sub S.B. 78 calls for the establishment of agricultural districts to preserve land in agriculture exempting land in the districts from the collection of specified utility assessments, the provision of additional benefits to land in those districts, forbidding county and township zoning from restricting certain farm markets, and provides landowners the right to farm by excluding generally accepted agricultural practices from air pollution laws, certain nuisance statutes, rules, and ordinances.

Any person who owns agricultural land may apply to have their land placed in the district by meeting several qualifying factors. Withdrawing land from a district during the five (5) year contract time subjects the landowner to a withdrawal penalty to be calculated by the county auditor.
Oklahoma

Legislation was adopted in 1972 concerning the valuation of property for taxation purposes. Right-to-farm legislation was adopted on 1 October 1980. The Oklahoma Feed Yard Act of 1981 may be considered an extension of the 1980 nuisance law. In that law, special emphasis is placed on the conditions for a feed yard not to be considered a nuisance.

Oregon

The effective farm use (EFU) zone was developed by the legislature in 1961. Also in that year, the farm tax deferral program was begun. The zones are used in rural farm areas and their primary purpose is to provide an area where farming can take place free from interference. However, it is recognized that EFU zoning substantially limits alternative uses of agricultural land. Therefore, various incentives and privileges are to be provided for farmers. Some of these incentives and privileges are 1) assurance that only compatible nonfarm uses will be allowed within the EFU zone, 2) nuisance or right-to-farm legislation, 3) no minimum income requirement to be earned in three out of the five preceding calendar years to qualify for special farm-use assessment, and 4) farm use valuation for inheritance tax purposes. The major extent of legislation passed occurred in the mid 1970's, when the Statewide Planning Goals and Guide Lines were released by the Oregon Land Conservation and Development Commission (LCDC). Goals number three and fourteen (enacted December 1974) are especially relevant to agricultural land use. Goal number three calls for agricultural lands to be preserved and maintained for farm use, consistent with existing
and future needs for agricultural products, forest, and open space. In addition, EFU zoning coverage was substantially expanded on. Goal number fourteen calls for urban growth boundaries (UGB) to be established to identify and separate urban land from rural land. Cities and counties are to cooperate in the establishment of the UGBs. This is to 1) assure orderly economic provision for public facilities and services, 2) meet LCDC goals, and 3) to encourage development within urban areas before conversion of rural areas.

Pennsylvania

There exists a wide variety of laws through which the state can influence and/or change land-use trends. The first law (Act) was introduced in 1966. Act 515 enables Pennsylvania counties to covenant with landowners to preserve land in farm, forest, water supply, or open space by taxing land according to its use value rather than the prevailing market value. Act 207 stipulates farmland is to be valued at its use value rather than the market value for inheritance tax purposes. If land use is changed within seven years after the death of the original owner of the land, penalties may be imposed.

Zoning was legislated into existence in 1968 by Act 284, which authorized local municipalities to establish zoning ordinances for the "protection and preservation of natural resources and agricultural land and activities". Legislation passed into law in 1968 allows the state and its counties to acquire land through purchase, contract, condemnation, or gift so that they may preserve, acquire, or hold land for open space use including farming.

Act 71 (1976) exempts farmers from being charged for municipal
improvements, such as the installation of water and sewer lines. Landowners may petition for the creation of agricultural areas to local government(s) through Act 43 (1981). These voluntary agricultural areas would have a minimum size of five hundred acres of viable farm land. Various incentives to keeping land in and disincentives from transferring land out of the area are provided for in the act.

Rhode Island

The state's legislation consists of two acts. In 1980, the Farm, Forest, and Open Space Act was passed by the General Assembly. The act recognizes that as the protector of the public interest, the state must encourage the preservation of farm, forest, and open-space land in order that an available source of food and other farm products is maintained close to the state's metropolitan areas. The state must actively seek to prevent the forced conversion of farm land, forest, and open space. To achieve the goal of preventing forced conversion, the state is to employ use value assessment of land. Use value assessment is based on the current undeveloped value of the land rather than the "highest and best use possible."

To qualify as farmland, land parcels must be larger than five acres in size and should be actively devoted to agricultural use. If the land is taken out of the program and/or is developed, the farmer is then subject to a development and land-use change tax. The amount of the tax is a percentage value of the fair market value of the developed land, and it is only estimated at the time when the land is either ineligible or is voluntarily withdrawn from use value assessment. Act H5691 (Farmland Preservation Act of 1981) instead of vaguely suggesting that
the state must preserve agricultural land and prevent forced conversion, suggests that the state acquire the development rights of existing farmland to insure that there will be an adequate amount of land for farming, open spaces, and ground water recharge areas.

**South Carolina**

The state has no laws pertaining to land-use regulations in agriculture. Several laws provide incentives to retaining land in agricultural production. In 1980, a state law commonly referred to as the "Righ-to-Farm Law," was passed. The law was passed by the General Assembly to protect farmers from undue hardships such as nuisance suits resulting from the normal every day operations of a farm.

Act 208 (1975) calls for a use value assessment for property taxes on farmland. The tax is based on a four percent assessment of the fair market value for agricultural use. Once the farm landowner has applied for and is receiving the preferential assessment treatment, a decision to change the land use to some nonagricultural use activity will subject the owner to "roll-back taxes" for the year that the changes takes place and for the five years preceding it.

**South Dakota**

According to the Division of Conservation of the South Dakota Department of Agriculture, no agricultural land-use legislation exists.

**Texas**

The state recently (5-13-81, Senate Bill 488) enacted into law a "Right-to-Farm Act" that ensures the right to farm by providing for limitations on nuisance actions, regulations, rules, and zoning
requirements concerning certain agricultural operations. No nuisance action shall be brought against an agricultural operation which has lawfully been in operation for one year or more prior to the date of such action, where the conditions or circumstances complained of as constituting the basis for the nuisance action have existed substantially unchanged since the established date of operation. The act formulates a new state policy to conserve, protect, and encourage the development and improvement of its agricultural commodities. This implies that the state must make efforts to reduce agricultural resource losses.

Utah

At the present time, no state laws or regulations regulating or influencing the use of agricultural land exist.

Vermont

State laws/programs relating to the protection of farmland came into existence in Title 24, Chapter 117 of the state laws. Title 24, Chapter 117 (1967) enables towns that have adopted a town plan and have established a planning commission to enact zoning ordinances. This allows towns to include in their zoning agricultural use zones whether they be exclusive or non-exclusive. Use value assessment designed to benefit landowners who are willing to make a long term commitment to keep their land in agricultural production, was added in 1977. In 1980, Executive Order 52 directed state agencies and state instrumentalities to avoid adversely impacting the preservation of agricultural lands through their actions. Right-to-Farm legislation was adopted in 1981.
Virginia

In the last two years, Virginia has passed into law six laws dealing with the use of agricultural land (four bills in 1981 and two in 1982). House Bill No. 1654 (3 March 1981) grants public bodies the necessary authority to acquire or designate land for use as open space. The land may be acquired by bequest, devise, gift, grant, or purchase for not less than five years duration. The bill negates the use of eminent domain rights to land acquired for the purpose of open space, but it does not limit the power of eminent domain in other cases. House Bill No. 1428 (20 March 1981) is similar to legislation in other states by declaring that state policy is to conserve, protect and encourage the development and continued improvement of its agricultural land for the production of food and other agricultural products. It goes on to redefine nuisance laws with respect to agricultural operations such that no agricultural operation, or its appurtenances, shall be deemed a nuisance due to any change of conditions in the surrounding area if it has been in operation for more than one year. This new nuisance interpretation does not affect the right of any person, corporation, or firm to seek payments resulting from original damages sustained by them. House Bill No. 1656 (21 March 1981) encourages local governments to create comprehensive plans to improve public health and safety and plan for the preservation of agricultural and forestal land. Zoning ordinances and districts are to be drawn with reasonable consideration to any existing land-use plan, current land-use trends and designed land-use patterns, with the goal of assuring the "most appropriate" use of land throughout the county or municipality.

Chapter 3.2 of House Bill No. 1655 (2 April 1981) deals with the
preservation of prime agricultural land. It is pointed out that the actions of various state agencies account for a significant portion of the prime agricultural land converted to nonagricultural use. To stop this wherever possible, state policies and actions should encourage the preservation of prime farmland.

House Bill No. 523 (9 February 1982) is a House Amendment to H.S. No. 1655. Prime agricultural land now is referred to as "important farmlands," which can be broken down into prime farmland, unique farmland, and farmland other than prime or unique farmlands. Under Senate Bill No. 355 (19 February 1982), an agricultural and forestal districts advisory committee was established to review requests for the formation of agricultural or forestal districts. Participation in the districts is voluntary. Minimum size of a district parcel is twenty-five acres. The initial district contract length is for eight years, but landowners no longer desiring to participate in the district may file a written notice of termination with the local governing body which created the district. A withdrawal tax penalty exists in that real estate previously included in the district is subject to roll-back taxes.

Washington

Washington's first legislation was the Open Space Taxation Act of 1970. Under this act, a voluntary incentive program would be developed to assess eligible farm, timber, or open space lands at their current use value rather than at their highest and best value. Amendments to the Open Space Taxation Act were added on in 1973. Additional laws were enacted in 1979. They were the State Inheritance Tax law (Ch. 209, Laws
of 1979), the Farmland Assessment Relief Law (Ch. 84, Laws of 1979), the Nuisance Law (Ch. 122, Laws of 1979), and the Boundary Review Law (Ch. 142, Laws of 1979). The State Inheritance Tax Law allows current use valuation rather than fair market valuation for closely owned family businesses and farms. The Farmland Assessment Relief Law was designed to discourage the spread of certain urban type improvements onto open space agricultural land. The Nuisance Law states that agricultural activities conducted on farmland, if consistent with established practices and established prior to any surrounding nonagricultural activities, will be considered reasonable and will not constitute a nuisance unless they jeopardize public health and safety. The boundary Review law states that when considering annexations, Boundary Review Boards must take into account the existence and use(s) of agricultural soils. More recently, cities and counties have been granted the power to implement land planning.

**West Virginia**

The state passed legislation dealing with preserving land in agricultural use in H.B. 1109 (July 1981). The act is designed to grant inheritance tax relief to inheriting family members of a farm where the principle owner has passed away. The tax will be assessed on the current use value rather than the fair market value of the property. H.B. 1216 (May, 1982) allows county commissions the option of developing and implementing farmland preservation schemes with voluntary participation in the program. H.B. 2020 (June, 1982) stipulates that it is the state's duty to preserve and protect agricultural production as it is a necessity to the welfare and common good of the state's citizens.
Nuisance suits cannot be brought against agricultural operations unless the complainants land-use existed before the neighboring agricultural production operations began and if the conduct of the agricultural operation being complained about has or will cause actual physical damage to the complainant or the complainant's property.

**Wisconsin**

State concern about agriculture resulted in the passage of the Farmland Preservation Act on 29 June 1977. The act was passed to assist local people who want to preserve farmland, and to provide tax relief to farmers who participate in the local programs. It is a two-stage bill, with stage I to run from 1977 to 1982 and stage II from 1982 and on. Under stage I, farmers can qualify for tax credits against their state income tax in two ways; 1) if their land is zoned for exclusive agricultural use or 2) by signing a contract agreeing not to develop their land for a specified period of time.

The income tax credit is based on household income. The lower the particular farmer's income, the higher the tax credit, implying an inverse relationship between the farmer's income and the tax credit. Property taxes up to $6000 are eligible for tax relief. If the farmer's parcel is eligible for stage II but the farmer chooses not to participate in the plan, then they must pay back the credits received through stage I. Under stage II, farmers may qualify for income tax credits without having to sign a contract by participating in exclusive farm-use zoning, provided that the local zoning meets the standards in the law for protecting farmland. Stage II imposes penalties upon farmers that do not review their contract, in that if the contract expires, the farmer(s)
must repay the tax credits granted in the previous ten years in two ways; 1) pay back in a year of contract nonrenewal and face no interest or 2) pay later and face a six percent interest charge. Tax credits after 1982 will only be available to those farmers whose land is in exclusive agricultural use or in an approved county plan preservation district.

**Wyoming**

The state of Wyoming does not have specific laws relating to agricultural land use.
VITA

Eric T. Marnell

Candidate for the degree
of
Master of Science

Thesis: On the Effectiveness of Agricultural Land-Use Controls

Major Field: Economics

Biographical Information:

Personal Data: Born at Hempstead, Long Island, New York on 4 November 1958; son of Robert James and Joyce Marnell.

Education: Graduated from Marina High School (Huntington Beach, California) in 1976. Received the Bachelor of Arts degree from the University of Colorado at Boulder in Economics in 1981. Completed requirements for the Master of Science degree in Economics at Utah State University in 1983; will begin doctoral study in Economics at Texas A & M University in 1983.

Professional Experience: Research Assistant, Utah State University, Department of Economics, September 1981 to December 1982; Teaching Assistant, Utah State University, Department of Economics, January 1983 to March 1983.