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A Time-Series Comparison of Alternative Agricultural Use-Value Estimates in New York

By

Richard N. Boisvert

and

Nelson L. Bills

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York 14853

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Since 1973, some New York farmland owners have been eligible for preferential property tax treatment. The tax preference is available under a section of the NYS Agriculture and Markets Law (Art. 25AA, Sec. 304) and takes the form of a tax exemption. The exemption is calculated as the difference between a farm parcel's full value -- the standard used to assess all real property -- and its value in use. This provision is distinct from the 10-year exemption from property taxes afforded new farm buildings and is only one of the many property tax exemptions that are commonplace in New York. Throughout the state, there are nearly 120 separate provisions for partial or total exemptions from local property tax levies (Swords, pp. 143-47).

Among these many provisions, the use-value exemption for farmland stands alone in terms of problems posed for public officials charged with its administration. Equally vexing are the problems emerging for public officials who depend on the property tax to fund public services in rural jurisdictions across the state. These problems can be traced in large part to methods used to establish the use-value of farmland each year. By law, state officials must determine per acre values in use by capitalizing estimates of annual net returns to land (Art. 25AA, Sec. 305). This approach conforms to widely accepted theories of land valuation (Barkley and Boisvert) but leads to two principal administrative problems. First, a variety of crops are produced in New York and net income for land varies by soil quality, crops grown and crop rotation. Second, net income can fluctuate from year to year reflecting short-term changes in yields, commodity prices and input prices. This variability in net income, combined with short-term changes in the capitalization rate, generate wide year-to-year swings in the value of farmland exemptions. From a political perspective these changes may be difficult to justify in a dairy state like New York where the use-value estimates vary directly with feed prices and may be inversely related to changes in net farm income or other measures of the overall economic health of the state's agricultural industry.

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*Richard N. Boisvert is a Professor in the Department of Agricultural Economics, Cornell University, and Nelson L. Bills is an Agricultural Economist with USDA-ERS-NRED stationed at Cornell University. Ann Kurtz collected much of the data and developed computer programs for most of the calculations. David Blandford and Loren Tauer made helpful comments on an earlier draft of this report, but the authors are, of course, solely responsible for remaining errors or omissions. The opinions expressed here are those of the authors and not necessarily those of USDA or Cornell University.

This report deals with the second of these administrative problems -- those introduced by year-to-year variability in the value of farmland exemptions. Specific objectives are to: (a) compare alternative farmland use values for a sample of New York counties and assess their variability over the 10-year period, 1973 through 1983, and (b) devise statistical methods to partition the variation in the values among the major components of the capitalization formula. The analysis is based on data developed for 21 New York counties. Results obtained have direct implications for state policies on farmland taxation.

The report is organized into four sections. The first section places the analysis in an historical perspective by describing the development of state policies for taxing farmland and the factors which precipitated recent administrative changes in the New York program. The second section describes the data and procedures used to develop estimates of farmland use value in 21 New York counties and partition their variability; a third section describes the empirical results. A concluding section is devoted to the study's implications for state property tax policy.

Background

Attempts to deal legislatively with property tax burdens imposed on agricultural land in New York were initiated in the mid-1960's. Proposals which would have amended the New York State real property tax law and granted farmland owners preferential tax treatment through use-value assessments were passed in both 1965 and 1966 by the New York State Legislature. The Governor vetoed both pieces of legislation, but appointed a temporary Commission on the Preservation of Agricultural Land and directed it to undertake a comprehensive study of the state's agriculture and the problems stemming from non-farm growth and development in rural areas.

The Commission's work, published in 1968, formulated the concept of an agricultural district (Commission on the Preservation of Agricultural Land). The district idea included provisions for use-value assessment of farmland, along with several other measures thought to promote the viability of commercial agriculture.

Agricultural Districts Law

The New York State Legislature passed the Agricultural Districts Law in 1971 and stated that:

> It is the declared policy of the state to conserve and protect and to encourage the development and improvement of agricultural lands. . . . It is also the declared policy of the state to conserve and protect agricultural lands as valued natural and ecological resources which provide needed open spaces . . . (New York Agriculture and Markets Law, §300).

To accomplish these objectives, the law provides for the formation of agricultural districts. A district is initiated by landowners who prepare a proposal that encompasses a minimum of 500 acres.[1] The proposal may be modified by state and local agencies or in response to public hearings, but once approved by the state and local authorities, the district becomes subject to all the law's provisions.

The law facilitates the retention of agricultural land in three basic ways. First, it restricts many of the usual options open to local governments whose boundaries overlap those of the agricultural districts. District legislation prohibits governments from enacting local ordinances regulating farm structures or practices beyond the normal requirements of health and safety. Formation of a district also modifies the proceedings of government in acquiring farmland by eminent domain and in advancing funds for public facilities to encourage nonfarm development. Agencies are required to give serious consideration to alternative areas before good farmland can be taken for public uses. A second provision requires state agencies to alter their administrative regulations and procedures to facilitate the retention of land in agriculture, provided they remain consistent with standards for health, safety and the protection of environmental quality.

Finally, the law may have direct financial implications for farmland owners. It limits the ability of governmental units to impose benefit assessments or special ad valorem levies on farmland within a district. The law also allows, but does not require, owners to pay taxes on land's value in an agricultural use. Owners of 10 or more acres which generated at least $10,000 in average gross sales in each of the preceding two years may make annual application for use-value assessment of their farmland.[2] Sales of commodities produced on rented land may be added to those from owned land to meet the $10,000 requirement. The gross sales requirement is waived for an owner-landlord who has initiated a written lease (for at least 5 years) with a farm operator who meets the $10,000 requirement. If land receiving an exemption is converted to a non-agricultural use, a rollback tax without interest or penalty is applicable to converted land for each of the preceding five years or the number of years during which use-value assessments

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[1]Beginning in 1975, the state has had authority to create districts in areas where land is predominantly unique and irreplaceable. These districts, however, must contain 2,000 acres or more. To date, this authority has not been exercised (Conklin and Gardner).

[2]Although this provision is commonly referred to as use-value assessment, it is actually administered as a tax exemption. The landowner is exempted from that portion of the tax liability due to the difference between the assessed value of the property and the use value, multiplied by an equalization rate.

were levied, whichever is less. Land in the tax parcel remaining in agricultural uses continues to be eligible for use-value assessment.[3]

Numbers of Districts and Use-Value Exemptions

Response to the legislation from the agricultural community was immediate. Initial proposals led to the creation of 19 districts, involving 173,000 acres, by the end of 1972 (Table 1); almost 800,000 acres were added during 1973. By 1982, just over 6.7 million acres (22 percent of New York's total land area) were included within agricultural districts. Since land other than farmland can be contained within

Table 1. Number of Agricultural Districts and Districted Acreage in New York State

Year	Number of Districts	Districted Acreage[a]	
		Total	Per District
		- - - - thousands	- - - -
1972	19	173	9
1973	113	966	9
1974	183	1,975	11
1975	256	3,290	13
1976	321	4,351	14
1977	348	4,793	14
1978	388	5,556	14
1979	408	5,838	14
1980	423	6,147	15
1981	433	6,359	15
1982	456	6,741	15

Source: Gardner.

[a]Rounded to nearest thousand acres.

[3]The law also provides for agricultural value assessment to owners not in a district but who are willing to make a commitment to keep their land in agriculture for eight years. If any land in a commitment is converted to a non-farm use by the owner or a subsequent owner while the commitment is in effect, all land in the commitment will be disqualified from use value assessment and be subject to a tax penalty of two times the taxes determined in the year following the conversion or breach of commitment.

districts, accurate information on the number of farms or amount of farmland in districts is difficult to obtain. To date, statewide estimates of farmland in districts are not available.

In sharp contrast with efforts to create districts, the law has led to relatively few tax exemptions for owners of New York farmland. In 1977, an estimated 4,000 tax parcels received exemptions (King). By 1980, the number of exemptions increased to about 10,100 (unpublished E&A data); this still represents less than seven percent of the more than 154 thousand farm parcels across the state (State Division of the Budget).[4] The total dollar value of the exemptions is not known. While the provisions have probably helped some farmers to hold the line on property taxes, USDA data suggest that in the aggregate, property taxes paid by New York farmland owners have continued to increase at a rate well above the national average. Between 1970 and 1979, property tax levies on farm property in New York rose by 122 percent, from $49.5 million to $111.0 million;[5] this is a significantly greater increase than the 49 percent increase nationally over the same period (Hrubovcak and Rountree).

Limited applications for agricultural exemptions in New York are explained largely by institutional factors -- eligibility requirements and administrative practices followed by local assessing jurisdictions. Many states limit eligibility with acreage and/or gross sales requirements but New York's $10,000 gross sales requirement is the Nation's highest. The 10-acre requirement applied to New York's 8.7 million acres in commercial farms does little to restrict applications by farm operators because in 1978 only 4,800 acres were in farms with fewer than 10 acres (U.S. Department of Commerce). The gross sales requirement does limit eligibility. In 1978 nearly 1.2 million acres (14 percent of all commercial land in farms) were owned and operated (or rented from others) by farmers who generated less than $10,000 in farm sales (Table 2). In theory, this places an upper limit on the amount of farmland eligible for the use value exemption. However, larger commercial farmers rent from others approximately one quarter of the land they operate. In a previous study, Boisvert et al. estimated that only 40 percent of the rented parcels were of sufficient size to meet either the 10-acre or the sales requirements for eligibility. They argued that

[4]The number of exemptions has continued to increase. In 1982 about 14,500 parcels received partial exemptions, while in 1983, the number was estimated at about 20,000 (Twentyman). This growth is partially explained by the increased visibility of the program during the implementation of administrative changes. Furthermore, more landowners have become eligible as the use values have declined over the past three years. However, participation still accounts for less than 13 percent of all farm parcels.

[5]Changes in total levies reflect additional taxes paid on farm buildings as well as farmland. However, value of buildings as a percent of total value of farm real estate in New York was stable at about 35 percent during the 1970's (USDA, 1975, 1979, 1981, 1983).

Table 2. Land Tenure Patterns on Commercial Farms for New York, 1978[a]

Value of farm products sold	Total		Owned and Operated		Rented from others	
	Thousand Acres	Percent	Thousand Acres	Percent	Thousand Acres	Percent
Under $10,000	1,251	14	1,066	12	185	2
$10,000 or more	7,440	86	5,363	62	2,077	24
Total	8,691	100	6,429	74	2,262	26

Source: U.S. Department of Commerce.

[a]A commercial farm had production valued at $2,500 or more during the Census year.

". . . the [l]aw effectively limits the application of use-value assessment to approximately 75 percent of New York's commercially-farmed land" (p. 18).

These estimates were made prior to recent amendments to the law which waive the sales requirement on rented land if a long-term lease is signed, but rental arrangements in New York have traditionally been characterized by year-to-year cash rents under verbal agreements (Bryant, 1976a,b; Knoblauch; Osterhoudt and Conklin). It seems unlikely that the potential tax advantages are sufficient to increase eligibility through written long-term leases on rented parcels not currently meeting the sales requirement.

In addition, many eligible farmland owners simply may have no incentive to apply for the use-value exemption. This stems from the state's long history of fractional assessment and the inequities among property classes resulting from a failure to update assessment rolls on a systematic basis. In the mid-1970's, a Governor's Commission estimated that statewide revaluation (excluding New York City) to 100 percent of full value for all property would lead to a net tax shift of $25 million (a 28 percent increase) to owners of farm property (State Division of the Budget). This implies that much of New York's farmland was being carried on the tax rolls at fractions of full value often well below those for non-farm property.

To put it another way, problems in property tax administration have historically led to "de facto" exemptions from property taxes for much of the state's farmland. Thus, it is not surprising that only a small fraction of the state's farmers has actually applied for the use-value exemptions available under the New York Law. If these interclass inequities were corrected through statewide full value assessment of all real property, the agricultural exemptions afforded by use values, assuming 100 percent participation, would have reduced property taxes on farm property by an estimated $49 million, an average of $8 per farmland acre in 1979 (Boisvert et al.).

Since the passage of the Agricultural Districts Law, its provisions for use-value exemptions have been the subject of frequent, often heated, debate. Although the stringent eligibility requirements and inequities in real property assessments have effectively limited the participation in the program, these factors have been less controversial than the magnitude of the use values themselves. Many in the farm community argued that the values were too high. High use-value estimates were attributed to the procedural choices made by the state in its annual determinations of value in use.

In 1971, the New York State Board of Equalization and Assessment (E&A) was given the responsibility for establishing agricultural use values. They chose to determine these values on the basis of comparable farm sales and appraisal information and to establish separate values by county for several broad categories of farmland. This required E&A to establish nearly 350 separate values each year, excluding the numerous ceiling values also required for orchards and vineyards in many counties across the state. Benchmark values, promulgated for the 1974 tax year, were determined initially by reviewing more than 15,000 sales and appraisals occurring between 1968 and 1973. Between 1974 and 1978, the values were reviewed annually, discussed at public hearings and then revised. Increases in use values averaged about eight percent per year during this period (McCord).

These administrative procedures were criticized from their inception. The objections raised to the sales-based methodology are familiar to most students of land valuation. First, because real estate transfers often involve both land and land improvements some fraction of a parcel's sales price must be attributed to improvements before a per acre value of the land can be obtained. Although farm residences, barns, silos and related farm improvements are valued routinely by local assessors, it was argued that employees of a state agency did not know local conditions well enough to make appropriate decisions. Second, farm property is often sold in small parcels and prospective buyers have logical economic reasons for offering high prices for parcels in close proximity to existing land holdings or those that would complement excess labor or machinery capacity. Finally, it is difficult to ascertain the intentions of a farmland buyer; it was argued that there was no consistent way to estimate the proportion of value due to urban influences or speculative motives of the owners.

E&A readily acknowledged the computational problems in the "sales" or "market" approach to estimating value, but went on to argue that these were minimized by a careful effort to ignore sales and appraisals involving add-ons and transactions with non-farm buyers. Of the 15,000 files reviewed for the 1968-73 period, E&A discarded about two-thirds of all sales and one-half of all appraisals (McCord).

E&A was also unsympathetic to suggestions that the Legislature's intent would be better served by substituting use values based on capitalized yearly net returns to land for the market approach. Their reservations were based on the lack of sufficient data to determine net returns to land and the need to select arbitrarily a capitalization rate. The latter problem is inherent in all exercises in asset valuation (Barkley and Boisvert), but problems with collecting data on net farm income are particularly severe in New York because of wide variations in soil quality, topography, and crop and livestock enterprises on the state's commercial farms. In addition, cash rental rates for farmland in New York have been shown to provide a poor basis for establishing yearly returns to land. Rental arrangements are often casual, and reflect in-kind remuneration and non-economic considerations (Knoblauch; Bryant; Locken, et al.).

Although there had been criticism of E&A's procedures throughout the 1970's, the extent of dissatisfaction became known only after E&A decided to update the basis for setting values by reviewing farmer-to-farmer sales in the state between 1974 and 1978 (McCord). Based on this review, E&A proposed increases in agricultural use values that averaged about 50 percent statewide for the 1979 tax year. In response to the unprecedented debate and lobbying by the farm community that followed, E&A decided to implement these increases gradually over several years. Before this process was completed, the Legislature intervened and amended the law significantly. E&A was directed to cooperate with other agencies in the development of farmland use values based on capitalization of net annual returns to farmland. The annual net returns are derived from enterprise budgets reflecting average cost and returns across the state and appropriate rotations and soil productivity, as measured by Total Digestible Nutrient (TDN) production, on each of about 1,200 individual soil mapping units found in New York. Under this procedure, a single set of values is applied in all upstate counties (Dunne and Lynk).

The Legislature's intervention probably reflected the political realities of the farmland assessment issue but the information base to support its decision was extraordinarily weak. There was little evidence to shed light on the advisability of such action and the likely repercussions on the taxpayers of the state. A case study, based on records for dairy farms in Columbia County, New York, showed that capitalizing net returns was an operational alternative for calculating use-value estimates but the study also indicated that both the market-based and capitalization approaches present computational difficulties so severe that one cannot be preferred over the other from an administrative point of view (Locken, Bills and Boisvert). Furthermore, this, and a more recent study by Dunne and Boisvert, indicated that each procedure could lead to distinctly different results, depending on methodological conventions used.

Among the unanticipated repercussions stemming from a shift to capitalized net returns were short-term changes in the use-value estimate and hence the size of exemption available to land owners. A 1981 study in two New York counties showed that the newly legislated procedures produced substantially higher use-value estimates for the 1981 tax year when compared to the market-based 1980 values (Bills and Boisvert). By implication, exemptions available to land owners -- computed as the difference between full value and use value -- were diminished in value.

Increases in use value were particularly abrupt for the owners of high quality land.

This result was corraborated by a more extensive study involving 21 of New York's 63 counties. For the area studied (39 percent of the state's commercial land in farms), the switch from market sales to capitalized net returns increased use value from $244 to $325 per acre on average (Boisvert and Bills). This 33 percent increase clearly implied lower tax benefits under the amended New York Law. However, the analysis also showed that the Legislature's intervention in the debate over use-value calculations resulted in more moderate increases than E&A would have obtained from the updated 1974-78 sales and appraisals data mentioned above. Prior to the legislative amendments, E&A had agreed to implement the increase implied in these proposed values over several years. Had the proposed values been in effect by 1981, the use values of cropland in the 21 counties would have averaged $351 per acre.

This recounting of legislative events does more than point out the perils and prospects which confront public officials concerned with property tax administration. It also highlights the need for continuing, organized analysis of the methodological issues which surround programs designed to give farmland owners preferential property tax treatment. A particularly noticeable gap in the informational base is a long-term assessment of alternative computational schemes. An emerging problem with the currently employed capitalized approach is the appearance of pronounced year-to-year fluctuations in the per acre use-value estimates. Per acre use values for mineral soils in upstate New York, shown in Table 3, clearly demonstrate the yearly variation associated with the capitalization approach. Percentage increases ranging up to 90 percent were recorded between 1981 and 1982. Uniform decreases, often in excess of 30 percent, were recorded over the 1982-83 period.

A small portion of this variability is due to marginal changes in the procedures for estimating these values and in the way that the values of orchards and vineyards were incorporated. In the analysis below, the data are revised to abstract from these procedural changes and the inherent variability in the capitalization procedure is compared with movements in use values based on annual updates of market sales and appraisal records. It is also important to identify the contribution of each component of the capitalization procedure to overall variability in capitalized net returns. Satisfactory answers to such questions have immediate implications for continuing deliberations over property tax policy for New York farmland owners.

Data and Procedures

This analysis compares the two alternative methods for valuing mineral soils used for the production of crops in 21 New York counties, for which adequate information on cropland by soil type could be obtained (Figure 1). These counties account for 37 and 39 percent, respectively, of New York's commercial farms and land in commercial farms (U.S. Department of Commerce). To isolate differences between rural and urban areas, some results are presented for two subgroups of counties: 12

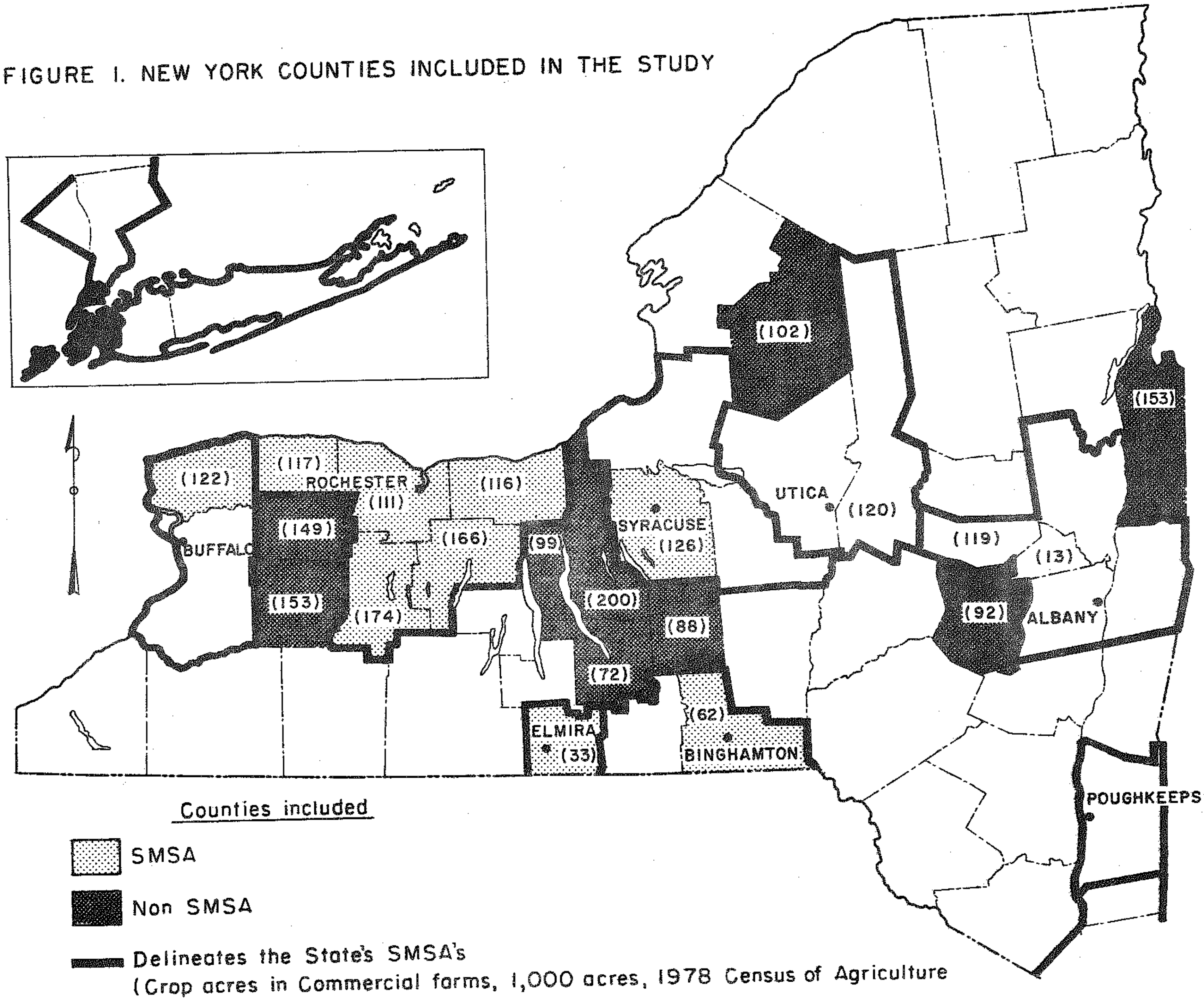
Table 3. Use Values for Eight Upstate New York Mineral Soil Groups.

1981 Soil Group[a]		Use Value 1981	1982	1983	1984	Change 1981-82	1982-83	1983-84
		--- $ per acre ---				------- % ------		
Group 1 (90-100)	H	860	780	560	400	- 9	-28	-29
	L	730	700	470	310	- 4	-33	-34
Group 2 (80-89)	H	710	670	470	340	- 6	-30	-28
	L	590	590	380	260	0	-36	-32
Group 3 (70-79)	H	540	560	380	280	4	-32	-26
	L	420	480	300	200	14	-38	-33
Group 4 (60-69)	H	320	400	230	140	25	-43	-39
	L	200	320	150	130	60	-53	-13
Group 5 (50-59)	H	180	340	190	130	89	-44	-32
	L	160	260	110	110	63	-60	0
Group 6 (40-49)	H	150	160	100	100	7	-38	0
	L	130	140	90	90	8	-38	0
Group 7 (25-35)		110	130	80	80	18	-39	0
Group 8 (< 24)		80	110	70	70	38	-36	0

Source: NYS Board of Equalization and Assessment.

[a]These soil groups were developed for the New York State Department of Agriculture and Markets and are to be used in New York State's use-value assessment program. All soil mapping units are classified by a TDN productivity index (given in parentheses, where 100 = 4.54 tons of TDN per acre). Production is assumed to take place in appropriate rotations. Detailed information on the classification of soils by mapping units is provided to the local Soil and Water Conservation Districts for purposes of calculating the distribution of soils by tax parcel. The "H" refers to high lime soils in the soil productivity class, while "L" refers to low lime.

FIGURE I. NEW YORK COUNTIES INCLUDED IN THE STUDY



Standard Metropolitan Statistical Area (SMSA) counties and nine non-SMSA counties. The SMSA counties contain or are in close proximity to several of upstate New York's large cities (Figure 1).

The new administrative procedures required E&A to capitalize net returns for land classified into ten mineral soil groups (Dunne). Thus, the construction of the two alternative estimates of cropland use values in each county group is accomplished in three steps. First, total cropland in each county is distributed among the numerous soil mapping units and aggregated into the ten soil productivity groups. Second, the land in these soil groups is redistributed among the land classes used for the period 1973-80 by making the correspondence between the TDN production implied by the new classes and the yields on which the old classes were based. Third, the two estimates of total cropland use value for the years 1973-81 are obtained by multiplying acreages in each soil group or land class by the appropriate per acre capitalized net return figure or market sales based value. The procedures for calculating the capitalized returns are described below, whereas the market sales based values are those actually used by E&A for use-value assessment during 1973-80. These values differed by county and, in each year, were distributed by E&A directly to local assessors just prior to finalizing the tax rolls.

Cropland by Soil Group

While modern published soil surveys are available for all the counties studied, estimates of acreage by soil mapping unit pertain to the total land area in the county. The surveys contain no estimates of cropland. To overcome this problem, unpublished data developed by USDA-ERS are incorporated into the study. The USDA data distribute crop production by soil mapping unit based on unpublished point sample data collected for the 1967 Conservation Needs Inventory. The 1967 percentage distribution of cropland by soil mapping unit for each county is applied to the corresponding aggregate "total cropland" on commercial farms as reported in the 1978 Census of Agriculture. By necessity, this procedure assumes that the distribution of cropland across soils has remained constant over the 1967-78 period.

Cropland is then assigned to one of ten mineral soil groups in a land classification system developed for the New York State Department of Agriculture and Markets. Each soil mapping unit is given an index value which reflects judgements about a soil's capacity to produce TDN. Soils falling into the first eight soil groups are judged to be usable for crop production. The TDN index values are based on yield estimates for corn silage and hay, in appropriate rotations. As shown in Table 4, they range from under 25 for soil group 8 to between 90 and 100 for soil group 1 (100 = 4.54 tons of TDN per acre).

In 1978 there were nearly 2.4 million acres of cropland in the 21 study counties. Table 4 also indicates the distribution of cropland across the eight soil groups. Only a small fraction of the total, 2.2 percent of the cropland, is in the highly rated group 1. Similarly, only 2.5 percent are in group 8, the least productive group.

Table 4. Estimated Cropland by Soil Group, 21 New York Counties, 1978[a]

1981 Soil Group[b]	Thousand Acres[c]	Percent[c]	1971-1980 Land Class[d]	Thousand Acres[c]	Percent[c]
Group 1 (90 - 100)	52	2.2	Class A $\geq$ 100 bu. $\geq$ 3,5 tons	531	22.2
Group 2 (80 - 89)	479	20.1			
Group 3 (70 - 79)	430	18.0	Class B $>$ 15 tons 2-3.5 tons	709	29.7
Group 4 (60 - 69)	279	11.7			
Group 5 (50 - 59)	471	19.7	Class C $<$ 15 tons $<$ 2 tons	964	40.4
Group 6 (40 - 49)	368	15.4			
Group 7 (25 - 35)	250	10.5	Class P pasture	184	7.7
Group 8 ($<$ 24)	59	2.5			
Total	2,388			2,388	

Sources: Cropland totals are estimates of total cropland from the 1978 Census of Agriculture. The distribution by 1981 soil group was based on unpublished data on cropland by soil mapping unit obtained from the 1967 Conservation Needs Inventory.

[a] Figure 1 indicates which counties are in the study.

[b] These soil groups were developed for the New York State Department of Agriculture and Markets and are to be used in New York State's use-value assessment program. All soil mapping units are classified by a TDN productivity index (given in parentheses, where 100 = 4.54 tons of TDN per acre). Production is assumed to take place in appropriate rotations. Detailed information on the classification of soils by mapping units is provided to the local Soil and Water Conservation Districts for purposes of calculating the distribution of soils by tax parcel.

[c] Rounded to nearest thousand acres. Detail may not add due to rounding.

[d] Land classes used for agricultural value assessment in New York prior to 1981. The numbers below the class are corn (grain or silage) and hay yields associated with each class. To facilitate comparisons, these yields were converted to TDN, and after assigning a rotation, a correspondence between the two systems was obtained: class A = groups 1 and 2; class B = groups 3 and 4; class C = groups 5 and 6, plus 1/2 group 7; class P = 1/2 group 7, plus group 8.

There are some slight differences in the distribution of cropland by county group but the overall pattern is quite similar (Appendix Table A). For example, in both groups, only a small fraction of cropland is in either of the extreme productivity categories. In the non-SMSA, 1.8 percent of the cropland is in soil group 1, while 4.3 percent is in group 8. For the SMSA counties, 2.5 percent is in group 1, while less than one percent is in group 8. About 53 percent (681 thousand acres) of total cropland in SMSA counties falls into groups 1-4 while 59 thousand acres (or 51 percent) of all cropland in non-SMSA counties are in these first four groups.

By making the correspondence between the yields and rotations for corn and hay used to group soils in 1981 and the yields which were used to define land classes, A, B, C and P in Table 4, one can also distribute cropland by quality on a somewhat different basis. This second land classification is the one originally developed by E&A and was used for purposes of use-value assessment prior to 1981. Distributing land according to this second classification is necessary for comparing the impact of the two administrative alternatives on the use value of cropland in the 21 counties.

Capitalized Net Returns by Soil Group

In addition to reclassifying soils, the new procedures require that the capitalized net returns to land be established by E&A on the basis of cost and returns data for commonly grown New York crops, corn and hay (see Knoblauch and Milligan for detailed procedures). The capitalization formula used is

$$(1) \quad V_{tij} = \frac{N_{tij}}{r_t}$$

where V_{tij} is use value per acre in year t for soil group i and lime class j; N_{tij} is net residual returns to land per acre in year t for land in soil group i and lime class j and r_t is the capitalization rate for year t. In using this formula, it is implicitly assumed that yearly net returns and the capitalization rate are constant in perpetuity. The possible difficulties resulting from these simplifying assumptions are well recognized (Barkley and Boisvert; Locken et al.; and Dunne) but they are administratively necessary. Residual returns to land for each of the soil groups are based on enterprise budgets for corn silage and hay, weighted according to appropriate rotations.[6] As required by law,

[6] According to Knoblauch and Milligan:

> In total, 14 economic profiles (residual returns to land) were constructed for eight soil groups. (Groups IX and X are not suitable for crop production.) Soil Groups I through VI have an economic profile for high-lime and another for low-lime soil mapping units. Soil Groups VII and VIII have an economic profile for low lime only since high-lime soil mapping units are almost nonexistent. For all except Soil Group VIII, the economic profile consists of an enterprise budget for corn and

the capitalization rate is the effective interest rate on new Federal Land Bank loans made in the Springfield District; it is the same rate used in calculating use values for federal estate tax purposes. To reduce year-to-year fluctuations both the net returns and the capitalization rate in year t are calculated as a simple five-year moving average using the most currently available cost and returns data. This necessitates a two-year lag (e.g., 1981 values are based on 1975-79 average).

Because the new system for calculating agricultural use values has been in operation only since 1981, it was necessary to construct an appropriate set of capitalized returns for the years 1973 through 1980. The physical input requirements and yields were assumed to remain constant over this time period. If the procedures had been adopted in 1973, it is likely that some input requirements and machinery complements etc. would have been modified slightly over time to reflect changes in production technology and farm practices, but lacking any objective basis on which to know what adjustments would have been made, it seemed advisable to isolate the differences in use values due to changes in input and output prices and capitalization rates.[7] (The five-year moving average residual returns to land for the eight soil groups are reported in Appendix Table B). The aggregate capitalized use values by county group are estimated by multiplying these figures by the acreages in each soil group. In turn, the values are multiplied by 0.9 to reflect the fact about 10 percent of all cropland is in roads, fences or otherwise unusable.

Despite attempts to reduce year-to-year fluctuations in the capitalized returns by using five-year averages, it is still important to understand the contribution of the several components of the formula to the remaining overall variability. At one extreme, one could conceptually examine every price, yield and input coefficient in the budgets

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Footnote 6 cont.

an enterprise budget for hay with the net income for the total economic profile being weighted on the specified rotation.

The enterprise budgets utilized in construction of the economic profile were constructed using the economic engineering approach (pp. 1-2).

[7]Although the procedures used in this study to calculate residual returns from corn and hay budgets are almost identical to those used by the state in the 1981, 1982 and 1983 tax years, the agricultural value estimates differ in two important respects. First, in the agricultural values actually used for tax purposes during 1981-83, the net returns to land in orchards and vineyards were given a small weight to reflect the fact that these crops occupy a small fraction of the mineral-soil cropland in the state. These returns are ignored in this study because a satisfactory procedure for valuing land in orchards and vineyards has yet to be developed. Second, some agricultural values for the poor soil classes have been set administratively at nominal values when estimated net returns were negative. Unless stated otherwise, these negative values were set to zero for purposes of this analysis.

underpinning the capitalized return estimates, but such an analysis would be extremely unwieldly. As an alternative, emphasis can be placed on the three major components of the formula. Rewriting equation 1 (ignoring the subscripts for simplicity) one has

$$(2) \quad V = \frac{N}{r} = \frac{R-C}{r},$$

where R is gross revenue per acre and C is production costs for all inputs other than land. From this expression one can easily derive the elasticities of V with respect to the three components. These are defined $\varepsilon(V,R)$, $\varepsilon(V,C)$ and $\varepsilon(V,r)$ respectively.

The elasticity of V with respect to the capitalization rate r is derived most easily by performing a logarithmatic transformation on (2)

$$(3) \quad \ln V = \ln(R - C) - \ln r, \text{ and}$$

$$(4) \quad \varepsilon(V,r) = \frac{\partial \ln V}{\partial \ln r} = -1.$$

Accordingly, the capitalized return falls in the same proportion as increases in the capitalization rate. The other two elasticities are derived as follows:

$$(5) \quad \frac{\partial V}{\partial C} = -\frac{1}{r},$$

$$(6) \quad \varepsilon(V,C) = -\frac{1}{r}\left[\frac{V}{C}\right]^{-1} = -\frac{1}{r}\left[\frac{\frac{R-C}{r}}{C}\right]^{-1}$$

$$= -\frac{1}{r}\left[\frac{C}{\frac{R-C}{r}}\right] = -\frac{C}{R-C}.$$

Similarly,

$$(7) \quad \frac{\partial V}{\partial R} = \frac{1}{r}, \text{ and}$$

$$(8) \quad \varepsilon(V,R) = \frac{R}{R-C}.$$

From equations (6) and (8), one may conclude that both elasticities depend on R and C. Assuming that $R - C > 0$, the elasticities with respect to R and C are positive and negative, respectively.[8]

[8]The signs are reversed if $R - C < 0$.

These equations are convenient for examining the percentage changes in V associated with an isolated one percent change in individual components of equation (2). However, to establish the importance of the components in explaining the historical variability in the capitalized values one must also decompose the variance of V. This decomposition begins by rewriting equation (2) as

$$(9)\quad V = \frac{R}{r} - \frac{C}{r}\,.$$

Letting $X_1 = R/r$ and $X_2 = C/r$, the variance of V can be written as

$$(10)\quad \sigma^2_V = \text{Var }(X_1 - X_2) = \sigma^2_{X_1} - 2\,\sigma_{X_1,X_2} + \sigma^2_{X_2}.$$

Because X_1 and X_2 are products of random variables, the decomposition of σ^2_V proceeds according to Bohrnstedt and Goldberger. Their exact expressions for the variance and covariances for products of random variables is given in Appendix C. Using the Kendall-Stuart asymptotic approximation, one may then write (where E is the expectation operator, σ^2 is variance and σ is covariance)[9]

$$(11)\quad \sigma^2_{X_1} = E^2(R)\,\sigma^2_{1/r} + 2\,E(R)\,E(1/r)\,\sigma_{R,1/r} + E^2(1/r)\,\sigma^2_R + RM_{X_1}$$

$$(12)\quad \sigma^2_{X_2} = E^2(C)\,\sigma^2_{1/r} + 2\,E(C)\,E(1/r)\,\sigma_{C,1/r} + E^2(1/r)\sigma^2_C + RM_{X_2}$$

$$(13)\quad \sigma_{X_1,X_2} = E(R)\,E(C)\,\sigma^2_{1/r} + E(R)E(1/r)\sigma_{1/r,C} + E(1/r)E(C)\sigma_{R,1/r} + E^2(1/r)\sigma_{R,C} + RM_{X_1X_2}.$$

The RM's are the remainders of higher order terms from Appendix C. Substituting equations (11), (12) and (13) into equation (10),

$$(14)\quad \sigma^2_V = \{E^2(1/r)\,\sigma^2_R + E^2(1/r)\,\sigma^2_C + [E^2(R) - 2E(R)E(C) + E^2(C)]\,\sigma^2_{1/r}\} + 2[E(R) - E(C)]E(1/r)\sigma_{R,1/r} + 2[E(C)-E(R)]E(1/r)\sigma_{C,1/r} - 2E^2(1/r)\,\sigma_{R,C} + RM_{X_1} + RM_{X_2} - 2RM_{X_1X_2}.$$

The first three terms of equation (14) are the direct contributions of R, C and 1/r to the variance of V. The next three terms are the first-order interaction effects, while the remainders represent higher order interactions. Each of these interactions reflects an influence on

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9For this decomposition using the Kendall-Stuart asymptotic approximation to be useful, it is necessary for the terms containing higher order moments to be small so that ignoring them has little effect on the estimated importance of the various components (Burt and Finley).

the variance of V that cannot be decomposed and attributed to one of the specific components. For ease of interpretation in a related application, Burt and Finley normalize each of the first six terms by dividing each by the sum of the first three terms. Thus, the terms (where S is the expression in { } from equation (14))

(15) $P_R = E^2(1/r)\ \sigma_R^2\ /\ S;$

(16) $P_C = E^2(1/r)\ \sigma_C^2\ /\ S;$ and

(17) $P_{1/r} = [E(R) - E(C)]^2 \sigma_{1/r}^2\ /S;$

can be interpreted as the net effects directly attributable to the three components, respectively, after compensating for the interaction among the three separate random components. These interaction effects can be measured relative to the direct effects by

(18) $P_{R,1/r} = 2[E(R)-E(C)]E(1/r)\sigma_{R,1/r}/S;$

(19) $P_{C,1/r} = 2[E(C)-E(R)]E(1/r)\sigma_{C,1/r}/S;$ and

(20) $P_{R,C} = -2E^2(1/r)\sigma_{R,C}/S.$

Empirical Results

The empirical results of this study are reported in two parts. The first compares average use value per acre across all land classes resulting from the two valuation methods. Emphasis is also placed on the differences between the SMSA and non-SMSA county groups and their implications for policy. Because E&A recently abandoned their valuation procedures based on market sales data, the analysis is limited to the 1973-81 period, with 1981 values being projected on the basis of 1973-80 rates of change. The section also focuses on the differences in the use values by soil group. The second part examines the variability in the use values generated from capitalized residual returns and attempts to explain which components of the capitalization formula contribute the most to overall variability.

Comparing CNR and MSM Use Values

In preparing this report, there were several factors that made it difficult to compare these two sets of agricultural use values. The differences in cropland classification were important but as explained above, the correspondence between the two systems was made rather easily. One major difficulty is that agricultural values based on the market sales method (MSM) used by E&A involved separate values by county for each land class, while a single set of capitalized net returns to land (CNR) is applied to all upstate mineral soils. The only efficient strategy is to begin with a comparison of the weighted average per acre use values for the 21-county aggregate and the SMSA and non-SMSA subgroups. This strategy disguises some of the inter-county variation, but a more disaggregate analysis would have little effect on the general conclusions. By weighting the values by the proportion of cropland in each county and soil group or land class, the importance of extreme use values for small fractions of total cropland is kept in proper perspective.

For purposes of comparison, the average agricultural use values estimated by both methods are reported for the 21 counties in Figure 2. Over the nine-year period, 1973-81, the average CNR-value per acre is $283; the values range from a low of $91 in 1974 to a high of $437 in 1978. The average MSM-values per acre range from $136 in 1973-74 to a projected high of $244 per acre in 1981. With the exception of the first two years, the CNR-values were at least 36 percent higher than the MSM-values and in 1978, the difference was more than 100 percent.[10]

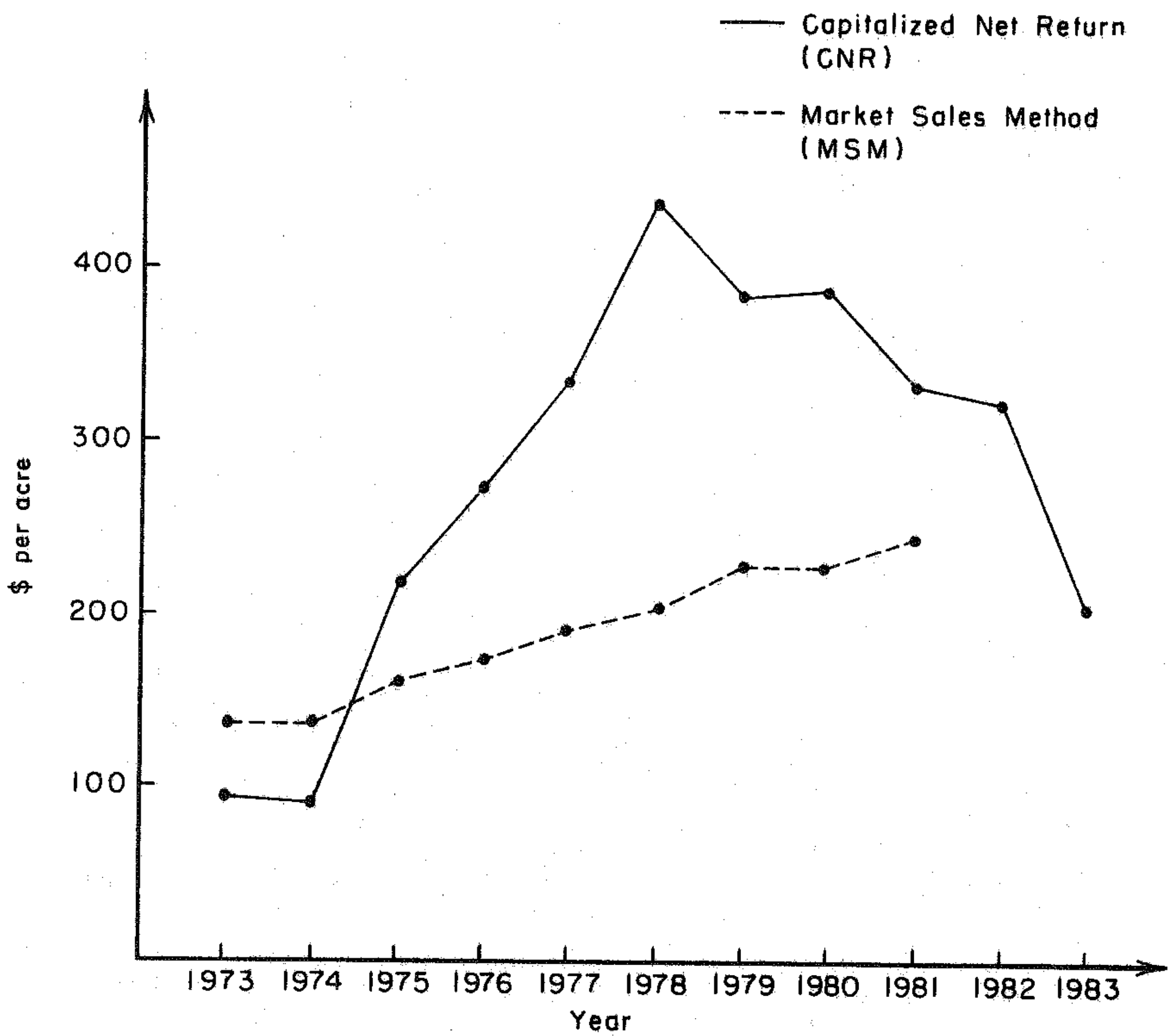
From a policy perspective, it is somewhat disturbing that these two methods yield such apparently inconsistent results. Both have a sound basis in theory, but operationally there is nothing inherent in the procedures to insure any degree of consistency. The CNR-values are influenced tremendously by short-term fluctuations in agricultural product prices and input costs. The highest values (in the mid-1970's) are explained largely by the favorable product prices in the early 1970's. Since the data on which the CNR-values are based are lagged two years, values peaked in 1978. This lag can lead to high CNR-values even if current product prices are low relative to production costs.

The MSM-values are not subject to the same variability. Throughout the nine-year period, E&A incremented its initial set of values by approximately eight percent a year. This consistent upward trend followed a general movement in the value of farm real estate in New York (McCord). Based on this nine-year trend, it is tempting to conclude that the CNR-values would most likely continue to lie above the MSM-values. However, such a generalization is misleading, given that in the past two years (1982-83), the CNR-values have continued to fall. Since MSM-values are not available for these years, it is impossible to know the exact nature of the differences. However, in 1979, E&A recommended an average 50 percent increase in the MSM-values over the previous year. This recommendation was based on data from a 1974-78 sample of farmer-to-farmer land sales and would have raised the 1980 and 1981 MSM-values above the CNR-values (Boisvert and Bills). This suggests that the eight percent yearly adjustment throughout the 1970's was on the low side.

The data in Table 5 indicate that the same general relationships between the two methods hold for the two county groups. Only in the first two years of the series are the average MSM-values per acre larger

[10]The differences would have been more pronounced had we followed E&A's practice for 1981-82 of assigning nominal positive values to land whose CNR is zero or negative and increasing the values to reflect the proportion of upstate mineral soils devoted to orchard and vineyard production.

FIGURE 2. ESTIMATED AVERAGE AGRICULTURAL USE VALUES OF CROPLAND, 21 NEW YORK COUNTIES



Source: Appendix Tables D and E
Note: MSM Values no longer available after 1981

Table 5. Estimated Average Agricultural Use Values for Two Groups of New York Counties[a]

Year	12 SMSA Counties[b]			9 Non-SMSA Counties[b]			CNR[c]	MSM[d]
	CNR[c]	MSM[d]	Percent CNR is of MSM	CNR	MSM	Percent CNR is of MSM	Percent SMSA is of Non-SMSA	Percent SMSA is of Non-SMSA
	-$/acre-			-$/acre-				
1973	102	137	74	84	134	63	121	102
1974	100	138	72	81	134	60	123	103
1975	233	163	143	199	156	128	117	104
1976	292	177	165	252	169	149	116	105
1977	355	196	181	308	184	167	115	107
1978	460	207	222	409	194	211	112	107
1979	409	234	175	355	221	161	115	106
1980	413	234	176	356	221	161	116	106
1981[e]	357	250	143	305	236	129	117	106
Average	302	193	150	261	183	137	116	105
Standard Deviation	132	42		118	38			
Coefficient of Variation	44	22		45	21			

[a]Weighted averages across all counties in the group. The weights are the acreages of cropland by soil class.

[b]See Figure 1 for counties included.

[c]Capitalized net returns to land (CNR) developed using procedures described in the text. The values on which these averages are based differ by soil class but are constant across all counties.

[d]Calculated using the agricultural values promulgated by E&A in the corresponding tax years. These values are based on a market sales method (MSM) of valuation. The values on which these averages are based differ by soil class and county.

than the average CNR-values. In the subsequent years, the CNR-values are substantially higher. Perhaps the most important result is that for both estimates, the average use values in the SMSA counties are consistently higher than in the non-SMSA counties. For the CNR-estimates, the agricultural values are an average of 17 percent higher in SMSA counties than in the non-SMSA group. The average difference between the two groups is slightly less (five percent) for the MSM-values.

The higher values in the SMSA group are explained in large part by the fact that in these counties a slightly higher proportion of cropland is high quality (see Appendix Table A). Almost by definition, these results are consistent with the notion of use-value assessment, but from a policy perspective, they are somewhat at odds with a strategy designed to retain the best land in agriculture. However, to the extent that poorer soils are controlled by limited-resource farmers, larger relative size of the tax benefits on the least productive soils could contribute to redistributional objectives.

This issue is better understood by comparing the relative use values of the most productive vs. the least productive land classes implied by the two procedures (Figure 3 and Appendix Table D). Because of the similarities between the two groups, little is lost by examining the relationship for the 21-county aggregate. The absolute difference in the per acre use values between land classes is generally larger for the CNR-method than for the MSM-method. In percentage terms, the situation is less clear. For example, the CNR-value for "A" cropland averages \$536 per acre. This is \$178 per acre or 50 percent higher than the value of "B" land. Over the nine-year period, the difference in the average value of "A" and "B" land using MSM-estimates is \$124 per acre; the value of "A" land is 59 percent higher than "B" land. The situation between "B" and "C" land is just the reverse. For the MSM-estimates, the \$210 per acre average value for "B" land is about 83 percent higher than the \$115 per acre average for "C" land. The difference when use values are estimated by CNR is \$217; the value of "B" land is estimated to be 153 percent higher than for "C" land.[11]

It is clear from this discussion that the CNR-method consistently places relatively higher differential values on the most productive cropland. The explanation is probably inherent in the nature of the two procedures. In the CNR-method, economic engineering requires specific assumptions about crop yields and rotations. As the productivity of the land rises, gross revenues in most budgeting procedures increase proportionately more than do production costs. (Some fixed costs could be the same.) In contrast, the difference in MSM-estimates across land classes are determined on a much more subjective basis. It is not surprising that attempts to allocate the sales value of a heterogenous parcel of land by land class would lead to a smaller differential, particularly between cropland of low to moderate quality.

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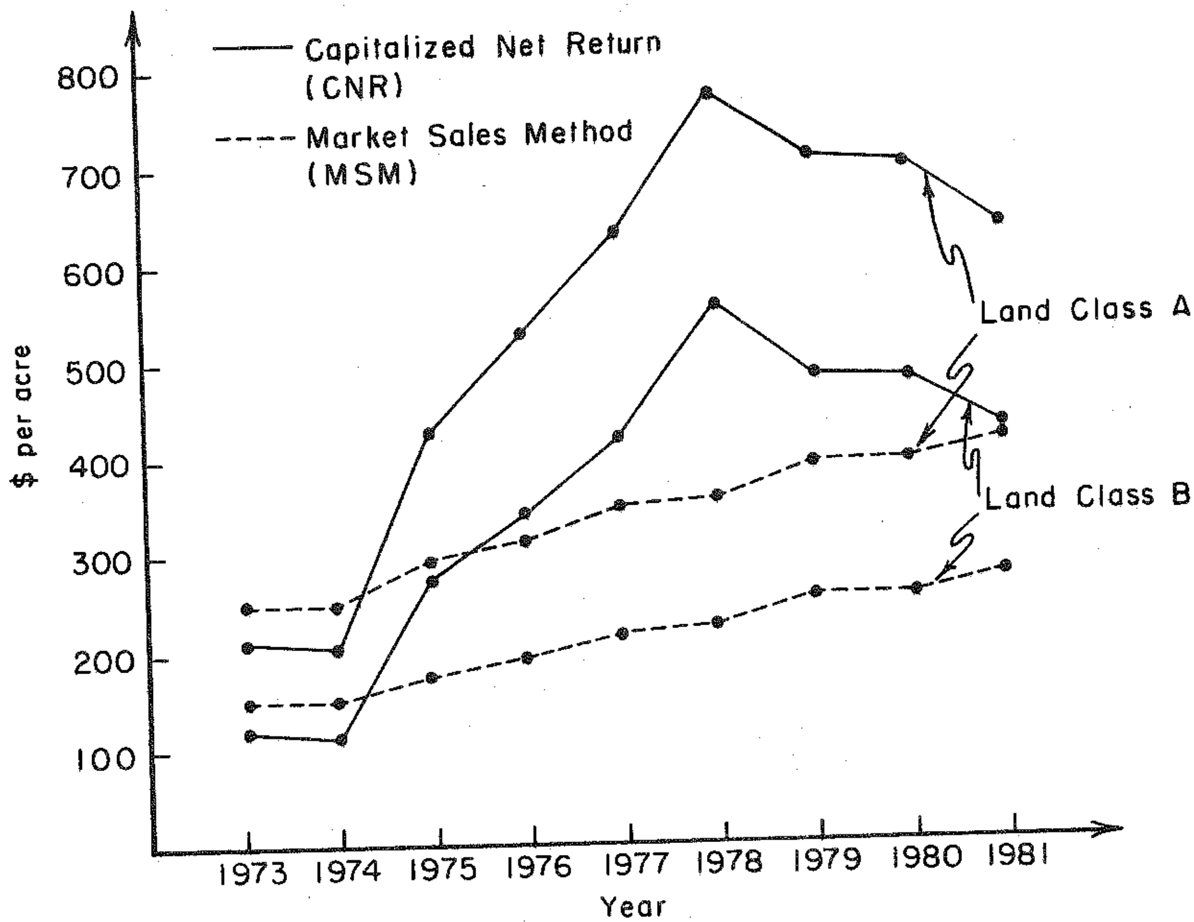
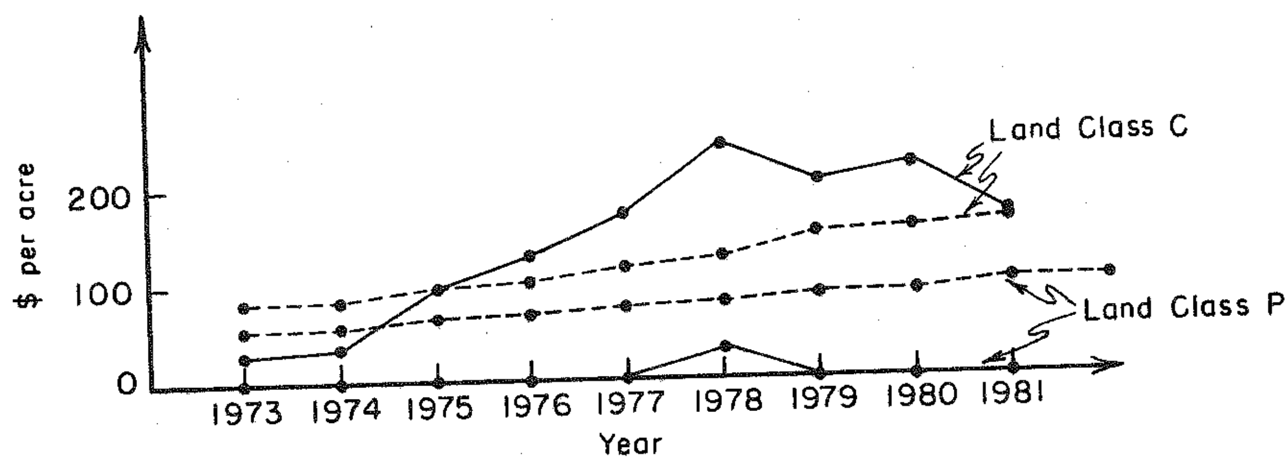
[11]Any comparison of the relative value of "P" land with other classes would be affected by the fact that many of the net return figures are negative and the CNR-values are set to zero.

FIGURE 3. ESTIMATED AGRICULTURAL USE VALUES OF CROPLAND BY LAND CLASS, 21 NEW YORK COUNTIES





Source: Appendix Table D

Variability in Use Values

In attempting to understand the policy implications of each technique for establishing agricultural use values, it is important to examine their variability over time as well as the absolute and relative size of the numbers across land class or soil group. The fluctuations will be reflected in changes in farmers' tax bills over time, as well as in the property tax revenues of local governments where a significant portion of the property tax base is agricultural property. As indicated in Appendix Table D, the variation in the CNR use values over the 1973-81 period as measured by either the standard deviation or the coefficient of variation is substantially larger than for the MSM-values. For the average per acre values, as well as for land classes "A", "B" and "C", the CNR's coefficients of variation are about double those for the MSM. This is not unexpected, given the sensitivity of capitalized net returns to short-run fluctuations in agricultural input and output prices.

The relatively small variation in the MSM-values is explained in large part by the fact that E&A elected to increase the initial set of values by approximately eight percent a year (McCord). These changes rather modest but would have had some implications for property tax bills and local government revenues, given that most assessment rolls in the state are not updated completely on a year-to-year basis. Beyond this explanation, there is no way to understand more about the variation in these values.

The situation for the CNR-estimates is quite different. As stated above, it is possible to examine the impact of the three major components of the capitalization formula (equation 2) on the capitalized values. The elasticities of V with respect to R, C, and r provide an initial estimate of the impact of each component, independent of the other two. From equation (4), we know that a one percent change in r, the capitalization rate, always leads to a one percent change in V. This is not true for R and C. The elasticities of V with respect to these two components depend on their initial levels. They are summarized for the 1973-83 period in Table 6. (Because one is not concerned with the MSM techniques here, two additional years of data could be included and the analysis focuses on all eight soil groups.)

Perhaps the most important information in Table 6 is reflected by the fact that all the average elasticities over the 11-year period have absolute values greater than unity. None is less than three. Thus, throughout the period, the agricultural values based on capitalized residual returns to land are more responsive to a one percent change in either gross revenue or total cost than they are to a one percent change in the capitalization rate. It is also true that both elasticities generally increase in absolute value as one moves from soil group 1 to 8, but the size of $\varepsilon(V,C)$ increases slightly relative to $\varepsilon(V,R)$. This is not unexpected in a budgeting exercise and confirms an earlier conjecture that as one moves from the more productive soils to less productive ones, revenue (R) falls relative to costs (C). The reduction in

Table 6. Elasticities of Capitalized Net Return to Land for 21 New York Counties with Respect to the Components of the Formula[a]

Soil Group	ε (V,R) 1973-83 Average	ε (V,R) Minimum Value	ε (V,R) Maximum Value	ε (V,C) 1973-83 Average	ε (V,C) Minimum Value	ε (V,C) Maximum Value	Ratio of the Average Elasticities $\frac{\varepsilon(V,R)}{\varepsilon(V,C)}$
1	4.0	2.8	6.1	-3.0	-5.1	-1.8	-1.3
2	4.1	2.9	6.0	-3.1	-5.0	-1.9	-1.3
3	4.7	3.2	7.5	-3.7	-6.5	-2.2	-1.3
4	8.2	3.7	18.1	-7.2	-17.1	-2.7	-1.1
5	7.6	4.0	15.4	-6.6	-14.4	-3.0	-1.2
6	8.0	-20.1	26.2	-7.0	-25.2	+21.6	-1.1
7	-5.0	-13.8	-2.4	+6.0	+3.4	+14.8	-0.8
8	-36.4	-227.6	+12.3	+37.4	-11.3	228.6	-1.0

[a]Calculated using equations (6) and (8) and the values of R, C, and r implied in the capitalized residual returns in Appendix Table E. The one exception is that in Appendix Table E, the values are set to zero if $R - C \leq 0$. For purposes here, the actual values of R and C were used even if they are less than zero. This is why the elasticities change sign for the last two soil groups. All numbers are rounded to nearest tenth. See Figure 1 and Table 4 for the counties included and the soil groups.

R-C affects both elasticities in a similar fashion, but because R is falling faster than C, the absolute value of equation (6) rises relative to that of equation (8).

While these elasticities provide a convenient way to compare the potential impact on agricultural values of relative changes in the components of the formula, they abstract from the actual year-to-year changes in R, C and r. Without further analysis, it is impossible to determine which of the components are actually responsible for the variation in V over the 1973-83 period. This is the purpose of the earlier discussion of variance decomposition. The empirical results of the analysis are discussed only for the combined 21 counties. In conducting the analysis, it was necessary to remove the significant trend from both the revenue and cost components. This is similar to Burt and Finley's strategy. If these trends had not been removed, the terms containing higher order moments in the expressions for variances and covariances (Appendix E) would have remained large and the accuracy of the linear approximation would have deteriorated substantially. Furthermore, in trying to establish each component's contribution to the overall variation, it seems reasonable to abstract from variability due strictly to trend.[12] The effects of this procedure are seen in Table 7.

As explained above, the variance decomposition relies on a linear approximation under the assumption that terms with higher order moments are small. The assumption is certainly valid in this case; the largest relative error is for soil group 7 and is only six percent. The direct contributions of the three components R*, C*, and 1/r are summarized in the first three columns (Table 8).[13] In all soil groups, less than two percent of the direct contribution to variance in the real value of V(V*) is due to the capitalization rate. The direct contributions of R* and C* do not exhibit this same consistency. The contribution of R* is highest for soil group 1 and is responsible for 80 percent of the direct variation in V*. The importance of R* falls dramatically as one moves to higher soil groups (i.e., to soils with lower productivity). For groups 7 and 8, R* is responsible for less than one-quarter of the direct contribution. For these low productivity soil groups, just over three-quarters of the direct variance in V* is attributable to C*. This contribution falls as one moves to the higher productivity soils and is only 18 percent for group 1.

The covariance effects are also significant, particularly for the first five soil groups. For these groups, the total covariance effect is negative and averages 27 percent the size of the total direct contribution. Without this negative relationship, the variation in V* would be even greater. Furthermore, the covariance between R* and 1/r nearly offset those of C* and 1/r. Thus, the covariance effect is almost totally attributable to R* and C*. Again, the role of 1/r is minimal.

These patterns have clear implications for policy if one attempts to lengthen the moving average or alter the CNR-procedure in any other manner to reduce year-to-year variability in the agricultural values. For the most productive soil groups, it is most important to reduce the variation in R*. Reduction in the variance in C* is most important for the less productive soils, but given the propensity of these net returns to be negative, they may remain unusable for agricultural value assessment purposes. This only serves to reinforce the concern about R*, but in using this information as the basis for policy, one must certainly recognize that the conclusions are based on a relatively short time

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[12]It might be argued that these components should have been deflated by some index of prices paid or received. This was not possible because many of the components of such indexes were used to construct R and C. Since R-C is being used to reflect yearly net returns to land, a more appropriate deflator might be an index of cash rents. As noted above, accurate information on cash rents is also not available for New York. Thus, an index of the value of farm real estate was chosen as a deflator.

[13]The (*) refers to deflated values (e.g. nominal values divided by an index of the value of New York farm real estate).

Table 7. Summary Data for Agricultural Use Values Based on Capitalized Residual Returns, 21 New York Counties, 1973-83[a]

Soil Group[b]	Average		Variance		Coefficient of Variation	
	Nominal	Deflated[c]	Nominal	Deflated	Nominal	Deflated
	- $ per acre -					
1	604	812	50,714	67,194	37	32
2	528	712	36,519	48,292	36	31
3	416	558	25,407	31,508	38	32
4	260	346	16,940	27,672	50	48
5	232	307	12,675	17,650	49	43
6	42	48	5,293	11,600	173	224
7	-170	-242	3,869	10,714	-37	-42
8	-20	-28	582	1,030	-120	-115

[a]See Figure 1 for the counties included. These are capitalized net returns developed using procedures described in the text. They are weighted averages, weighted by the county acreages in each soil productivity and lime class. Negative values for soil groups 6, 7 and 8 are retained here. See Appendix Table E for the nominal yearly figures by soil productivity group.

[b]Soil productivity classes are those used by E&A since 1981. See Table 4 for details.

[c]For purposes of these calculations, V* (equation 2 and footnote 11) was calculated by dividing it and R and C by a five-year average index of the value of New York Farm Real Estate (1977=100) (USDA, 1975, 1979, 1981, 1983; Clifton and Crowley, 1973). This was done to facilitate the variance decomposition on Table 8. As Burt and Finley suggest, if the components of the decomposition contain a strong trend, the higher order terms will remain large and the approximation will be imprecise. In this case, the result was to reduce the trend in R and C but because many of the data points were divided by a number less than 1, the overall variance of R*-C*, and thus V* was increased. In all but one case, the variance relative to the mean, as measured by the coefficient of variation, declined.

Table 8. Decomposition of the Variance of the 1973-83 Deflated Capitalized Value of Agricultural Land, 21 New York Counties

Soil Group[b]	Direct Effects[a]				Covariance Effects[a]				Total Variance of Capitalized Value[c]	Linear Approximation	Relative Error[d]
	Revenue	Cost	Capitalization Rate	Total	Revenue and Rate	Cost and Rate	Cost and Revenue	Total			
1	72,985 (0.80)	16,846 (0.18)	1,627 (0.02)	91,458	9,562 (0.10)	-9,276 (-0.10)	-25,292 (-0.28)	-25,006	67,194	66,452	0.01
2	49,617 (0.79)	12,276 (0.19)	1,250 (0.02)	63,143	7,370 (0.12)	-6,875 (-0.11)	-15,788 (-0.25)	-15,293	48,292	47,850	0.01
3	31,143 (0.71)	11,915 (0.27)	769 (0.02)	43,827	4,983 (0.11)	-5,346 (-0.12)	-12,338 (-0.28)	-12,701	31,508	31,126	0.01
4	24,853 (0.67)	12,006 (0.32)	296 (0.01)	37,155	2,717 (0.07)	-3,153 (-0.08)	-9,777 (-0.26)	-10,213	27,672	26,942	0.03
5	14,533 (0.61)	9,224 (0.38)	234 (0.01)	23,991	2,030 (0.08)	-2,522 (-0.11)	-6,119 (-0.26)	-6,611	17,650	17,380	0.02
6	6,598 (0.45)	8,011 (0.55)	6 (0.00)	14,615	219 (0.01)	-355 (-0.02)	-3,406 (-0.23)	-3,542	11,600	11,073	0.05
7	2,299 (0.21)	8,537 (0.78)	142 (0.01)	10,978	-672 (-0.06)	1,690 (0.15)	-1,890 (-0.17)	-872	10,714	10,106	0.06
8	347 (0.24)	1,081 (0.76)	2 (0.00)	1,430	-30 (-0.02)	51 (0.04)	-431 (-0.30)	-410	1,030	1,020	0.01

[a]Derived from equations (14) - (20). Reading from left to right, the numbers in parentheses are P_R, P_C, $P_{1/r}$, $P_{R,1/r}$, $P_{C,1/r}$ and $P_{R,C}$, respectively.

[b]See Table 4 for a description of soil groups and Figure 1 for the counties.

[c]Taken from Table 7.

[d]Total variance less the linear approximation divided by total variance.

series and the implications could change as more years of data become available. Such a result serves only to reinforce the difficulties associated with use-value procedures that are inherently sensitive to short-run fluctuations in economic variables.

Summary and Implications

The widespread adoption of preferential property tax treatment of agricultural land is among the most pervasive state policies directly affecting U.S. farmland in the past 25 years. These provisions are designed to reduce property tax bills on farmland where the market value exceeds its value in agricultural production.

Public officials responsible for legislating and administering these laws can dramatically affect the number of land owners eligible to participate in the programs and the monetary rewards that each participant receives. The purpose of this paper is to describe the New York Law, discuss participation in the program over its relatively short history and analyze the impact of recent legislative and administrative changes in New York's procedures for determining agricultural use values.

The New York Legislature provided for use-value exemptions more than a decade ago, but to date only a small proportion of farmland owners have applied for and received property tax reductions. This limited participation can be traced directly to the general underassessment of farmland relative to other classes of property by local assessing officers, eligibility requirements which restrict program entry to large commercial farms or landlords with large landholdings and procedures used to value farmland in its current use.

Although these factors have affected the scope of the agricultural value assessment program, the recent policy debate focused almost exclusively on procedures used to value New York's farmland in its current use. Use values based on market information (farm sales and appraisals) collected and maintained by the New York State Board of Equalization and Assessment, were criticized severely by the farm community. The legislative remedy -- use values based upon a soil productivity index and the capitalization of net returns to land -- was implemented for the first time in the 1981 tax year. The impact of these procedural changes on the use value of agricultural land was analyzed by applying alternative valuation systems to farmland used for crops in 21 New York counties.

The results demonstrate clearly that computational choices in New York's use-value assessment program affect significantly the use value of cropland in the aggregate, as well as the relative values of land of different quality. The implications of the CNR-procedures differ depending on whether one looks at the first two years of the program or at the mid-to-late 1970's. Based on the distribution of 2.4 million acres of cropland by productivity class in 21 counties, the weighted average CNR-value in 1973-74 would have been about $90 per acre compared with the $136 average using the MSM-values actually implemented in these early years. From 1975 through 1980, the CNR-values would have been substantially higher than the MSM-values. Since 1978, there has been a general downward trend in the CNR-values. Had the Division of Equalization and Assessment continued to develop MSM-values, it is likely that they would have been higher than the CNR-values in the 1980-83 period.

Because other factors affect participation in the agricultural assessment program, it is not possible to determine how these two methods of use valuation would affect participation over time. However, it is clear that when the average CNR-values are highest, they are highest across individual soil groups as well. Thus, one could logically conclude that for a given participant (other things being equal) neither of the methods would have led to consistently larger tax exemptions over the program's 10- to 12-year history.

In addition to these implications relative to the size of property tax exemptions, the results have policy significance for farmland retention, be they explicit or implicit in the Agricultural District Law. These implications stem from the relative valuation of cropland of different quality. In both cases, the agricultural values vary directly with land quality, but in the case of the CNR-method, the most productive (A) land is valued on average at 3.8 times the value of relatively low quality "C" land. For the MSM-values, "A" land is valued at only 2.9 times the value of "C" land. Given that local assessed values are unlikely to be differentiated as effectively by cropland quality, the CNR-values may in fact provide a greater relative tax exemption to the least productive soils. This is probably inherent in the system, but may well be counter productive if the objective is the retention of the most productive land.

The increased variability of the CNR-estimates has several implications. First, the added uncertainty about the exemption value from year to year may decrease the attractiveness of commiting land to an agricultural use for an extended period. Second, because of the two-year lag in data, and the fact that the CNR-values reflect in large part the capitalized net value of dairy feed, the fluctuations can also be out-of-phase with the general trends in state farm income. Finally, there is increased concern about the potential effects of the program on the stability of the property tax base from local governments in rural areas, where agricultural property constitutes a significant proportion of the tax base. There are no data to document how widespread this problem is, but as the size of the exemptions change, tax rates needed to raise local government revenues could change dramatically. This could shift some of the tax burden to nonagricultural land, but since tax rates would change, the percentage of property value exempt may not accurately reflect the tax benefits afforded farmland owners. Any attempt to have the state reimburse local governments for lost revenues would accommodate the local inequities, but would shift the cost of the program to taxpayers across the state.

An option to state reimbursement for the purpose of stabilizing revenue for local governments is to take measures which reduce year-to-year variability in the CNR-estimates. A number of measures could be considered. First, procedures now used to average per acre costs and returns over a five-year period could be revised. A longer moving average (e.g., 10 years) could smooth the series substantially but the data requirements would increase and problems could be encountered in reconciling budget information over such a long time period. Other methods of computing a five-year moving average could also be considered. For example, data for the previous seven years could be considered in the calculations, with provisions for retaining the value for the most current year and dropping high and low values for the remaining years. The extent to which such schemes would reduce year-to-year variation when compared to the technique now used is an empirical question and would change over time.

A second strategy would be to maintain the current five-year moving average but place upper and lower bounds on year-to-year changes in per acre use-values (perhaps in percentage terms). This administrative step, although completely arbitrary, would moderate yearly variation in the use-value estimates while accommodating longer term trends if the limits are triggered over a period of years. This technique could possibly win wide support because of its simplicity.

Finally, it would also be possible to bracket year-to-year movements in any (or all three) of the capitalization formula components. From the analysis above, it is clear that much of the variance in use values can be traced to yearly movements in revenues triggered by changes in hay and corn silage prices. Because changes in production costs and the capitalization rate contribute relatively little to variation in value for the most productive soils, establishing brackets for gross revenue would be the most efficient in this case. The situation is less clear for the poorer soils. However, when compared to the second alternative above, this strategy is much more cumbersome administratively.

Further modifications for the New York Law, whether focused on state reimbursement or alterations in CNR-procedures, should be analyzed carefully prior to their implementation. A logical extension of this research would be to simulate the impact of such modifications on the tax bill of farmland owners and to gauge the effect on revenues available to local taxing jurisdictions.

Regardless of the future direction of property tax policy for farmland, neither alternative method for estimating use values discussed in this study is without its difficulties. Administratively, the MSM-values are more stable over time and are derived from procedures most consistent with local assessment practices. They provide a great deal of flexibility in interpreting sales and appraisal data and distributing economic value to broadly defined land classes. Considerable judgment and flexibility is also involved in the initial design of the CNR-procedures, but once implemented, the change in values from year to year becomes a function of very short-run changes in farm prices, costs and interest rates. This leads to serious problems, particularly for the less productive soils where the values can be negative much of the time. Because most of the variation in the CNR-values for the highly productive soils is due to variation in gross revenue, one must obviously be concerned about a procedure that relies heavily on market prices for agricultural commodities that are inherently unstable from year to year and for which accurate market information is difficult to obtain.

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Appendix Table A. Estimated Cropland by Soil Group, Two Groups of New York Counties, 1978

1981 Soil Group[a]	County Groups[b] SMSA Thousand Acres[d]	County Groups[b] SMSA Per-cent[d]	County Groups[b] NonSMSA Thousand Acres[d]	County Groups[b] NonSMSA Per-cent[d]	1971-1980 Land Class[c]	County Groups[b] SMSA Thousand Acres[d]	County Groups[b] SMSA Per-cent[d]	County Groups[b] NonSMSA Thousand Acres[d]	County Groups[b] NonSMSA Per-cent[d]
Group 1 (90-100)	32	2.5	20	1.8	Class A > 100 bu. ≥ 3,5 tons	310	24.1	221	20.0
Group 2 (80- 89)	278	21.7	201	18.2					
Group 3 (70- 79)	230	18.0	200	18.1	Class B > 15 tons 2-3.5 tons	371	28.9	338	30.6
Group 4 (60- 69)	141	11.0	138	12.5					
Group 5 (50- 59)	298	23.3	172	15.6	Class C < 15 tons < 2 tons	525	41.0	439	39.7
Group 6 (40- 49)	162	12.6	206	18.6					
Group 7 (25- 35)	129	10.1	121	10.9	Class P pasture	76	5.9	108	9.8
Group 8 (<24)	11	0.9	48	4.3					
Total	1,281		1,106			1,282		1,106	

Sources: Cropland totals are estimates of total cropland from the 1978 Census of Agriculture. The distribution by 1981 soil group was based on unpublished data on cropland by soil mapping unit obtained from the 1967 Conservation Needs Inventory.

[a]These soil groups were developed for the New York State Department of Agriculture and Markets and are to be used in New York State's use-value assessment program. See Table 4 for details.

[b]See Figure 1 for the counties and county groups in the study.

[c]Land classes used for agricultural value assessment in New York prior to 1981. See Table 4 for details.

[d]Rounded to nearest thousand acres. Thus, detail across land and soil groups may not add.

Appendix Table B. Yearly Returns and Capitalized Values for Cropland in New York State

Soil Group[a]	Capitalized Value[b] (V)	Capitalization Rate[c] (r)	Yearly Return to Land (Rotation Weighted)[d] (N')	Property Tax Rate[e] (i)	Property Tax[e] (iV)
1967-71 Average[f]					
1H	$321.85	0.0828	$32.41	0.0179	$5.76
1L	245.08		24.68		4.39
2H	263.85		26.57		4.72
2L	193.25		19.46		3.46
3H	215.29		21.68		3.85
3L	143.20		14.42		2.56
4H	125.72		12.66		2.25
4L	55.31		5.57		0.99
5H	106.55		10.73		1.91
5L	36.05		3.63		0.65
6H	11.72		1.18		0.21
6L	-		-6.10		
7	-		-17.39		
8	-		-3.27		
1968-72 Average					
1H	295.36	0.0830	29.92	0.0183	5.41
1L	226.75		22.27		4.15
2H	254.99		25.83		4.67
2L	186.38		18.88		3.41
3H	209.67		21.24		3.84
3L	132.97		13.47		2.43
4H	121.92		12.35		2.23
4L	53.31		5.40		0.98
5H	111.75		11.32		2.05
5L	43.14		4.37		0.79
6H	14.71		1.49		0.27
6L	-		-5.46		
7	-		-17.02		
8	-		-1.94		
1969-73 Average					
1H	590.80	0.0836	60.38	0.0186	10.99
1L	521.23		53.27		9.69
2H	498.53		50.95		9.27
2L	429.06		43.85		7.98
3H	402.05		41.09		7.48
3L	324.27		33.14		6.03
4H	292.07		29.85		5.43
4L	222.60		22.75		4.14
5H	237.77		24.30		4.42
5L	175.15		17.90		3.26
6H	96.09		9.82		1.79
6L	26.61		2.72		0.49
7			-12.71		
8			-1.16		

Appendix Table B. (cont.)

Soil Group[a]	Capitalized Value[b] (V)	Capital-ization Rate[c] (r)	Yearly Return to Land (Rotation Weighted)[d] (N')	Property Tax Rate[e] (i)	Property Tax[e] (iV)
1970-74 Average[f]					
1H	$734.97	0.0858	$76.51	0.0183	$13.45
1L	654.76		68.16		11.98
2H	616.52		64.18		11.28
2L	536.60		55.86		9.82
3H	493.76		51.40		9.04
3L	404.32		42.09		7.40
4H	369.55		38.47		6.76
4L	289.63		30.15		5.30
5H	296.54		30.87		5.43
5L	216.62		22.55		3.96
6H	131.03		13.64		2.40
6L	51.10		5.32		0.94
7	-		-12.72		
8	-		-2.02		
1971-75 Average					
1H	866.95	0.0862	90.25	0.0179	15.52
1L	767.44		79.89		13.74
2H	732.85		76.29		13.12
2L	634.29		66.03		11.35
3H	587.22		61.13		10.51
3L	501.25		52.18		8.97
4H	451.01		46.95		8.07
4L	351.68		36.61		6.30
5H	371.47		38.67		6.65
5L	272.72		28.39		4.88
6H	182.32		18.98		3.26
6L	83.48		8.69		1.49
7	-		-13.82		
8	-		-2.02		
1972-76 Average					
1H	1035.99	0.0879	109.09	0.0174	18.03
1L	945.20		99.53		16.45
2H	885.94		93.29		15.42
2L	802.09		84.46		13.96
3H	726.59		76.51		12.64
3L	643.21		67.73		11.19
4H	566.48		59.65		9.86
4L	513.30		54.05		8.93
5H	467.14		49.19		8.13
5L	383.76		40.41		6.68
6H	255.94		26.95		4.45
6L	172.55		18.17		3.00
7	-		-5.53		
8	33.71		3.55		0.59

Appendix Table B. (cont.)

Soil Group[a]	Capitalized Value[b] (V)	Capital-ization Rate[c] (r)	Yearly Return to Land (Rotation Weighted)[d] (N')	Property Tax Rate[e] (i)	Property Tax[e] (iV)
1973-77 Average[f]					
1H	$975.49	0.0897	$104.28	0.0172	$16.78
1L	852.10		91.09		14.66
2H	831.81		88.92		14.30
2L	708.42		75.73		12.18
3H	682.97		73.01		11.74
3L	593.64		63.46		10.21
4H	512.72		54.81		8.82
4L	389.24		41.61		6.69
5H	431.15		46.09		7.42
5L	343.69		36.74		5.91
6H	237.32		25.37		4.08
6L	89.99		9.62		1.55
7	-		-15.34		
8	-		-2.04		
1974-78 Average					
1H	960.59	0.0913	104.32	0.0173	16.62
1L	943.83		102.50		16.33
2H	831.31		90.28		14.38
2L	672.01		72.98		11.63
3H	705.71		76.64		12.21
3L	560.13		60.83		9.69
4H	513.81		55.80		8.89
4L	390.33		42.39		6.75
5H	443.46		48.16		7.67
5L	387.38		42.07		6.70
6H	224.77		24.41		3.89
6L	92.17		10.01		1.59
7	-		-16.37		
8	-		-0.58		
1975-79 Average					
1H	866.22	0.0945	97.19	0.0177	15.33
1L	733.69		82.32		12.99
2H	752.67		84.45		13.32
2L	622.46		69.84		11.02
3H	633.78		71.11		11.22
3L	501.25		56.24		8.87
4H	457.04		51.28		8.09
4L	324.51		36.41		5.74
5H	396.97		44.54		7.03
5L	267.38		30.00		4.73
6H	191.35		21.47		3.39
6L	58.82		6.60		1.04
7	-		-20.16		
8	-		-0.21		

Appendix Table B. (cont.)

Soil Group[a]	Capitalized Value[b] (V)	Capital-ization Rate[c] (r)	Yearly Return to Land (Rotation Weighted)[d] (N')	Property Tax Rate[e] (i)	Property Tax[e] (iV)
1976-80 Average[f]					
1H	$854.95	0.091	$94.90	0.020	$17.10
1L	764.29		84.85		15.30
2H	724.18		80.35		14.45
2L	633.52		70.30		12.65
3H	598.90		66.45		11.95
3L	508.24		56.40		10.15
4H	419.78		46.60		8.40
4L	327.47		36.35		6.55
5H	350.55		38.90		7.00
5L	260.44		28.90		5.20
6H	139.01		15.40		2.75
6L	48.35		5.35		0.95
7	–		-20.85		
8	–		-2.70		
1977-81 Average					
1H	618.17	0.0952	71.20	0.020	12.35
1L	527.31		60.75		10.55
2H	518.38		59.70		10.35
2L	427.00		49.20		8.55
3H	425.95		49.05		8.50
3L	334.56		38.55		6.70
4H	255.25		29.40		5.10
4L	164.39		18.95		3.30
5H	213.24		24.55		4.25
5L	121.85		14.05		2.45
6H	23.63		2.70		0.45
6L	–		-7.75		
7	–		-32.95		
8	–		-6.75		

[a]See Table 4 for TDN levels of soil groups. L = low lime; H = high lime.

[b]Calculated by equation (1), where N is the yearly return to land less property tax (N = N' - iV).

[c]Effective interest rate on new Federal Land Bank loans from the Springfield District.

[d]These are yearly returns to land based on enterprise budgets for corn and hay averaged to account for appropriate rotation. Procedures follow those in Knoblauch and Milligan. Costs and revenues are adjusted by appropriate agricultural price indices from (New York Crop Reporting Service).

[e]Tax rates are in decimal fractions as calculated from New York data on value of farm real estate and property taxes from Hrubovcak and Rountree and USDA. Equivalently, V = (N' - iV)/r.

[f]These are five-year averages used for the tax year that is two years beyond the last year of the average.

Appendix C

The purpose of this appendix is to present the exact expressions for the variance of the difference between two random variables, the variance of a product of random variables and the covariance of products. These expressions are derived in Baumont and Bohrnstedt and Goldberger. However, from these expressions, it is easy to see how the approximations in the text are derived, once the appropriate substitutions are made.

Variance of the Weighted Sums of Random Variables

Letting X_1 and X_2 be two random variables, a and b be constants and $\Delta X_i = (X_i - EX_i)$, one can write

$$\begin{aligned}\sigma_{(aX_1+bX_2)}^2 &= E[aX_1 + bX_2 - E(aX_1 + bX_2)]^2 \\ &= E\{a[\Delta X_1] + b[\Delta X_2]\}^2 \\ &= E\{a^2[\Delta X_1]^2 + 2ab\Delta X_1\Delta X_2 + b^2[\Delta X_2]^2\} \\ &= a^2 E[\Delta X_1]^2 + 2ab\, E[\Delta X_1\Delta X_2] + b^2 E[\Delta X_2]^2 \\ &= a^2 \sigma_{X_1}^2 + 2ab\sigma_{X_1,X_2} + b^2\sigma_{X_2}^2 .\end{aligned}$$

If $a = 1$ and $b = -1$, then one has equation (10).

Variance of the Product of Random Variables

According to Bohrnstedt and Goldberger, if x and y are random variables and $\Delta x = X - Ex$ and $\Delta y = y - Ey$, then

$$\sigma_{xy}^2 = E[xy - E(xy)]^2$$

can be expanded to

$$\begin{aligned}\sigma_{xy}^2 = {} & E^2(x)\sigma_y^2 + E^2(y)\sigma_x^2 + 2E(x)\, E(y)\sigma_{x,y} + E[(\Delta x)^2(\Delta y)^2] \\ & + 2E(x)\, E[\Delta x(\Delta y)^2] + 2E(y)\, E[(\Delta x)^2(\Delta y)] - (\sigma_{x,y})\, (\sigma_{x,y}).\end{aligned}$$

If one lets x = R or C and y = 1/r, then the linear approximation to $\sigma_{x,y}$ (represented by the first three terms) is given by equations (11) and (12).

Covariance of Products of Random Variables

According to Bohrnstedt and Goldberger, if x, y, u and v are random variables and the Δ notation is the same as above,

$$\begin{aligned}
\sigma_{xy,uv} &= E[xy - E(xy)][uv - E(uv)] \\
&= E(x)\ E(u)\sigma_{y,v} + E(x)\ E(v)\sigma_{y,u} + E(y)\ E(u)\sigma_{x,v} \\
&+ E(y)\ E(v)\sigma_{x,u} + E[(\Delta x)(\Delta y)(\Delta u)(\Delta v)] \\
&+ E(x)\ E[(\Delta y)(\Delta u)(\Delta v)] + E(y)\ E[(\Delta x)(\Delta u)(\Delta v)] \\
&+ E(u)\ E[(\Delta x)(\Delta y)(\Delta v)] + E(v)\ E[(\Delta x)(\Delta y)(\Delta u)] \\
&- \sigma_{x,y}\ \sigma_{u,r}
\end{aligned}$$

Letting x = R, u = C, and y = v = 1/r, then the linear approximation of σ_{X_1,X_2} in equation (13) can be derived directly from the first four terms of this expression.

Appendix Table D. Alternative Agricultural Use Values of Cropland, 21 New York Counties[a]

Year	1973-1980 Land Classes[b]														
	A			B			C			P			Average		
	CNR[c]	MSM[d]		CNR	MSM		CNR	MSM		CNR	MSM		CNR	MSM	
	$/acre														
1973	212	248	(85)[f]	117	149	(79)	27	81	(33)	0	52	(0)	93	136	(68)
1974	204	249	(82)	111	150	(74)	30	81	(37)	0	52	(0)	91	136	(67)
1975	428	291	(147)	276	174	(159)	98	96	(102)	0	61	(0)	217	160	(136)
1976	532	317	(168)	347	193	(180)	128	100	(128)	0	66	(0)	273	173	(158)
1977	630	345	(183)	421	213	(198)	168	112	(50)	0	71	(0)	333	191	(174)
1978	775	358	(216)	554	224	(247)	240	122	(197)	28	76	(37)	437	201	(217)
1979	710	392	(181)	487	255	(191)	201	144	(140)	0	86	(0)	384	228	(168)
1980	703	392	(179)	482	255	(189)	215	144	(149)	0	86	(0)	387	228	(170)
1981[e]	633	415	(153)	424	275	(154)	163	156	(104)	0	91	(0)	333	244	(136)
Average[g]	536	334		358	210		141	115		3	71		283	189	
Standard Deviation	212	62		160	47		77	28		9	15		126	40	
Coefficient of Variation	40	19		45	22		55	24		300	21		45	21	

[a]See Figure 1 for the counties included.

[b]They are the land classes used for agricultural value purposes during these years. See Table 4 and McCord for more details.

[c]Capitalized net returns to land (CNR) developed using procedures described in the text. These are weighted averages, weighted by the acreages by land class. The correspondence between the 1973-80 land classes and soil classes used since then is outlined in Table 4.

[d]Calculated using the agricultural values promulgated by E&A in these tax years. They are based on market sales information and differ by county. These are weighted averages, weighted by the acreages by land class.

[e]The MSM values are projected on basis of average growth rates 1973-80.

[f]This is the percent CNR is of MSM.

[g]Although the values for CNR are available for 1982 and 1983, the summary statistics are calculated on the 1973-81 period for comparison purposes.

Appendix Table E. Agricultural Use Values of Cropland Based on Capitalized Residual Returns, 21 New York Counties[a]

Year	Soil Group[b] 1	2	3	4	5	6	7	8	Average
	- - - - - - - - - - - - - $ /acre								- - - - - - - - -
1973	235	210	157	56	55	-[c]	-	-	93
1974	217	203	150	54	61	-	-	-	91
1975	482	422	322	207	178	30	-	-	217
1976	605	524	399	268	221	53	-	-	273
1977	710	622	484	326	277	84	-	-	333
1978	868	765	611	467	373	163	-	30	437
1979	790	701	569	361	338	94	-	-	384
1980	853	686	561	363	367	95	-	-	387
1981	685	629	503	304	283	65	-	-	333
1982	705	617	492	303	264	52	-	-	323
1983	491	431	336	156	139	-	-	-	204
Average	604	528	416	260	232	58	0	3	280
Standard Deviation	225	191	159	130	113	50	0	9	116
Coefficient of Variation[d]	37	36	38	50	49	87	-	331	42

[a]See Figure 1 for the counties included. These are capitalized net returns developed using procedures described in the text. They are weighted averages, weighted by the county acreages in each soil productivity and lime class.

[b]Soil productivity classes are those used by E&A since 1981. See Table 4 for details.