The Relationship Between Farm Income and Asset Values, 1950-1977

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Analysts and other commentators on developments in the U.S. farming sector have often pointed out that farm land prices rose each year from the mid-1950's through the 1960's even though operators' net farm income was at first relatively stagnant, and later rose but slowly. For most persons, this observation has implied that farm land had advanced in price during this period even though the return it earned had not risen, or had risen much less.

This conclusion, however, is not correct, primarily because the trend in operators' aggregate net farm income is not a suitable indicator of the trend in returns to farm real estate over these years. An appropriate analysis strongly indicates that the return to farm land rose significantly faster than land prices over the 1954-71 period.

Because the mistaken view of the past historical relationship is so often cited and apparently widely accepted, it may be coloring present attitudes toward and analyses of current farm land market developments. Why worry about recent divergent trends in returns and land prices, some seem to be saying, when that was the norm for many years prior to 1972? And given the mistaken notion that land prices had outrun returns, analysts have been led to construct lengthy lists of other factors that must have propelled land prices to their significant gains of 1954-71, and which are presumed to remain operative. But if returns actually rose faster than land prices, it becomes apparent that influences other than returns had a negative net effect on land prices. Seen in this light, it may be that one powerful negative factor--the upward trend in the general level of interest rates over this period (that is, the rise in the opportunity cost of investing in farm land)--may have more than offset the many positive influences listed by analysts. The common interpretation of the 1954-71 rise in land prices is thus reversed--a conclusion that may be of more than passing interest to present farm land market analysts and participants.

The use of operators' net farm income as a measure of returns to farm real estate has persisted in spite of indications that this course was flawed. In the mid-1960's, for instance, papers by Walter Chryst and by Robert Herdt and Willard Cochrane concluded that land price gains in the face of stable farm income were not a "paradox" as others were saying.[1] Their work indicated that land prices were rising because of the combined effect of two factors: (1) technological advances that lowered unit costs of production, and (2) price support programs that maintained output prices in the face of the tendency of the technological gains to increase total farm output. They thus concluded that these factors had led returns to land to rise even though net farm income had been stagnant. Most other analysts, however, failed to note that this finding had adverse implications for the analytical value of their comparisons of land price trends with those of income.

Another form of evidence was provided by Robert Reinsel in 1973, when he pointed out that relative net returns received by farm landlords in stable agricultural areas had remained remarkably constant for many years, indicating that net rents had risen as fast as land prices.[2] Again, most other analysts appear to have ignored the probable implication of this result for returns to land generally.

Perhaps the most comprehensive evidence, however, consisted of the estimates of relative returns to equity in farm production assets published annually in The Balance Sheet of Agriculture.[3] While the relatively low level of this series attracted analytical comment, its upward trend--which indicated that returns to assets were rising faster than asset values--seems to have escaped significant attention.

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[1] For references to these and other studies of land prices, see the section on land price trends (pp. 441-444) in "Agricultural Finance and Capital Markets," by John R. Brake and Emanuel Melichar, Part VI, A Survey of Agricultural Economics Literature, Volume 1, Lee R. Martin, editor, University of Minnesota Press, 1977, pp. 411-494.

[2] "Land Rents, Values, and Earnings," by Robert D. Reinsel, paper presented at the meeting of the American Agricultural Economics Association, August 1973.

[3] For the most recent data, see Table 24, Balance Sheet of the Farming Sector, 1978, Supplement No. 1, U.S. Department of Agriculture, October 1978.

Thus evidence contradicting the common view has been at hand but largely ignored. Apparently the deficiencies of the comparison of operators' income with land prices, which underlies the common view, have not been appreciated. It appears useful, therefore, to summarize these defects and then to trace a path by which they may be remedied, using the approach and data of the USDA to calculate a valid measure of the relative return to farm assets.

When the trend of net farm income of farm operators is compared with the trend of the index of farm real estate value per acre, an analyst is implicitly examining the trend of the ratio of these two series. Such a ratio is plotted as the solid line in Chart 1. The declining trend exhibited by the ratio during the 1950's and 1960's indicates, as has been noted, that real estate prices rose faster than operators' net farm income.

Several defects inherent in comparing operators' net income with land prices are apparent:

(1) an aggregate return--operators' income--is being compared with a unit price--real estate value per acre;

(2) a significant part of the real estate is owned by landlords, but their net rental income is not included;

(3) In computing net income, interest paid on the real estate debt has been subtracted as a production expense;

(4) net income is being regarded as a return to real estate alone, ignoring other farm assets involved in producing income;

(5) furthermore, net income is in reality a return not only to assets, but also to operators' labor (including family labor) and management.

As a result of these faults, the comparison of the trend of income with that of real estate prices may be biased or invalidated by changes over time in, respectively:

(1) the number of acres of land used in farming;

(2) the proportion of farm real estate owned by landlords, and the relative profitability of rented versus owned land;

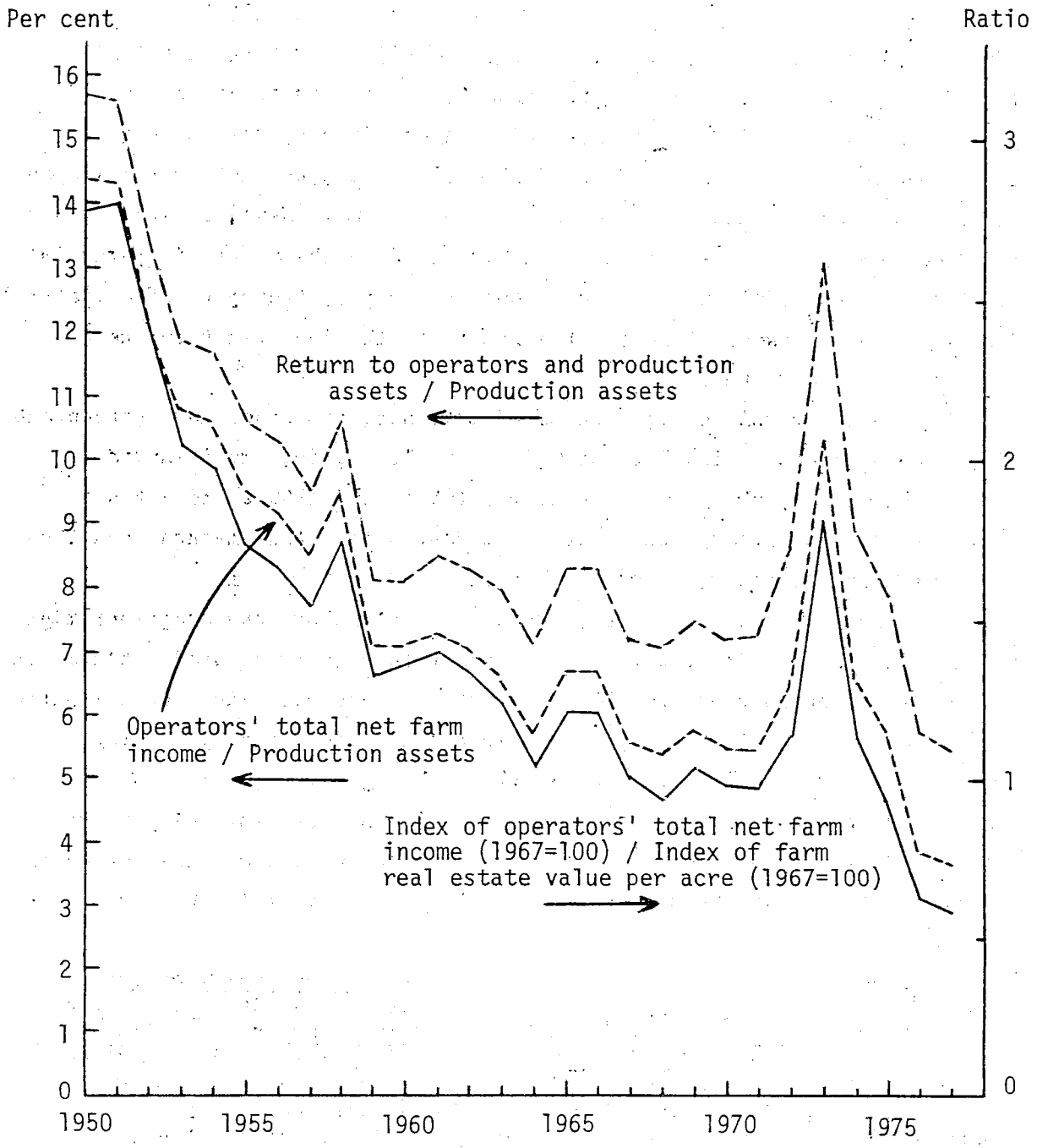
(3) the debt/asset ratio, and the average interest rate on outstanding debt;

(4) the proportion of total assets that consists of real estate;

(5) the proportion of total operator inputs (assets, labor, and management) represented by assets.

Chart 1

Three faulty measures of relative returns to farm real estate and production assets



To remedy defects (1) and (4), income might be compared with the aggregate dollar amount of both real estate and other farm assets. Chart 1 also shows one such measure--operators' net farm income as a percentage of total farm production assets. It is evident that this change would not alter the common conclusion; that is, the downward drift of the ratio indicates that the value of production assets rose faster than operators' net income during the 1950's and 1960's.

To remedy, in addition, defects (2) and (3), operators' net income in this new comparison might be replaced by the return to operators and production assets. The steps involved in going from operators' net income to that return are shown in Table 1.[4] First, the net rental income of farm landlords is added to the operators' income. Next, interest paid on farm debt is also added. Finally, because the value of operators' dwellings is not included in farm production assets, that part of operators' income which consisted of an imputed return to the investment in these dwellings is subtracted.

The return resulting from these adjustments, expressed as a percentage of production assets, is also shown in Chart 1. Again, the downward trend exhibited by this ratio during the 1950's and 1960's indicates that the value of production assets rose faster than that return, and thus the common conclusion would not be altered.

To remedy defect (5), returns to operators' labor and management might be estimated and subtracted from the total return just computed. Estimates made for this purpose by the USDA are shown in Table 1. The return imputed to operators' labor (including family labor) is calculated by valuing total man-hours of all farm labor at the cash wage rate paid to hired labor, and then subtracting total wages (including perquisites) paid to hired workers. Valuing operators' labor in this fashion appears reasonable as long as a separate return is also imputed to operators' management

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[4] Primary sources for data shown in Table 1 are Balance Sheet of the Farming Sector, 1978, Supplement No. 1, Tables 23 and 24; The Balance Sheet of Agriculture, 1968, Table 23; The Balance Sheet of Agriculture, 1965, Table 16; and Farm Income Statistics, July 1978; U.S. Department of Agriculture. Additional detail and recent revisions were provided by ESCS, NEAD, USDA. For 1950-59, additional data were estimated by the author to derive series more comparable with those published for later years.

Table 1. Derivation of residual return to farm production assets, and percentage rate of return

Year	Operators' net farm income	Plus: Net rent	Plus: Interest on debt	Less: Imputed return to equity in dwellings	Equals: Return to operators and production assets	Less: Return imputed to operators' Labor	Less: Return imputed to operators' Management	Equals: Return to production assets	Production assets (January 1)	Return as percentage of production assets
	Billions of dollars									Per cent
Annual average:										
1950-54	14.0	1.3	.7	.6	15.4	8.4	1.6	5.4	113.5	4.7
1955-59	11.5	1.1	1.0	.7	12.9	7.3	1.6	4.0	132.4	3.0
1960-64	11.6	1.4	1.6	.9	13.7	5.8	1.9	6.0	172.4	3.5
1965-69	13.2	2.0	2.6	1.0	16.7	5.1	2.3	9.3	219.3	4.2
Annual:										
1970	14.2	2.1	3.4	1.1	18.6	5.3	2.7	10.5	256.3	4.1
1971	14.6	2.2	3.6	1.2	19.3	5.6	2.8	10.9	265.5	4.1
1972	18.7	3.5	3.9	1.3	24.8	5.4	3.3	16.1	286.7	5.6
1973	33.3	5.7	4.7	1.5	42.3	5.4	4.5	32.3	322.7	10.0
1974	26.1	5.1	5.8	1.8	35.2	6.0	4.6	24.6	394.5	6.2
1975	24.5	4.6	6.4	2.0	33.5	5.9	4.5	23.1	425.4	5.4
1976	18.8	4.1	7.4	2.3	28.0	5.8	4.8	17.4	482.9	3.6
1977	20.5	3.9	8.5	2.5	30.4	6.1	4.9	19.4	549.5	3.5

(that is, operators' time is regarded as more valuable than hired workers' time by the amount imputed for "management"). The amount imputed for management is 5 per cent of gross farm income (specifically, cash receipts from farm marketings plus government payments). This is an arbitrary percentage, but if it is logical to estimate management charge as a proportion of gross income, the specific percentage chosen will affect the level but not, to any significant extent, the trend in the amounts that remain as the return to assets. After the imputed returns to operators' labor and management are subtracted, a residual return to production assets alone has been estimated.

The relative return to production assets based on this estimate is shown in the last column of Table 1 and is plotted as the solid line in Chart 2. The relative return exhibits a significant upward trend during the 1954-71 period, indicating that returns to production assets tended to rise faster than the value of those assets. Thus the correction of defect (5) turns out to have great analytical importance.

What caused the reversal in trend, as compared with the measures shown in Chart 1? Most importantly, as shown in Table 1, the return imputed to labor fell sharply over this period. In addition, the total return to labor, management, and assets increased somewhat. While the imputed charge for management also increased, it offset only a small part of the consequent expansion in the residual return to assets. The latter more than doubled between 1955-59 and 1965-69, while the value of production assets did not quite double. Thus, as shown in the last column of Table 1, the relative return to production assets rose from an average of 3.0 per cent in 1955-59 to 4.2 per cent in 1965-69.

The impact of the reduction in the total value of operators' labor is dramatically evident in Table 2, which shows how the total relative return to operators' labor and management and to production assets was split among these three inputs. While the total relative return tended to decline over the 1954-71 period, the portion imputed to operators' labor fell much faster. As a result, the residual portion attributable to assets rose significantly.

Analysts have frequently noted the decline in the number of farm operators, often described as "the substitution of capital for labor." By and large, however, they have failed to note that this development

Table 2. How the total return was split among operators' labor, operators' management, and production assets

(All returns are expressed as a percentage of the value of production assets)

Year	Total return to operators and assets	Return imputed to operators'		Residual return to production assets
		Labor	Management	
1950	15.7	8.0	1.5	6.2
1951	15.6	7.9	1.5	6.2
1952	13.4	7.2	1.3	4.8
1953	11.9	7.2	1.3	3.3
1954	11.7	7.0	1.3	3.4
1955	10.6	6.6	1.3	2.7
1956	10.3	6.3	1.3	2.7
1957	9.5	5.4	1.2	3.0
1958	10.6	5.0	1.2	4.4
1959	8.1	4.7	1.1	2.2
1960	8.1	4.0	1.1	3.0
1961	8.5	3.7	1.1	3.6
1962	8.3	3.4	1.1	3.8
1963	8.0	3.2	1.1	3.7
1964	7.1	2.8	1.1	3.2
1965	8.3	2.5	1.1	4.7
1966	8.3	2.3	1.1	4.9
1967	7.2	2.3	1.0	3.8
1968	7.1	2.3	1.0	3.7
1969	7.5	2.2	1.1	4.2
1970	7.2	2.1	1.1	4.1
1971	7.3	2.1	1.1	4.1
1972	8.6	1.9	1.1	5.6
1973	13.1	1.7	1.4	10.0
1974	8.9	1.5	1.2	6.2
1975	7.9	1.4	1.0	5.4
1976	5.8	1.2	1.0	3.6
1977	5.5	1.1	.9	3.5

has reduced the proportion of the total return that can logically be attributed to labor and has increased the proportion that can logically be attributed to capital. Estimates presented in Tables 1 and 2 indicate that this effect was so pronounced as actually to raise the relative return to assets even though asset prices were rising.

The results thus lead to a new, surprising question: why did farm real estate prices seemingly fail to rise fast enough to capitalize fully the rise in the residual return to assets during the 1954-71 period? Several hypotheses could be put forth; for instance, a part of the growth in return resulting from technological advances or from government farm programs might have been regarded as temporary rather than permanent by purchasers of farm land. A logical explanation, however, is that the rise in returns was in fact quite fully capitalized, but that the capitalization rate used by land purchasers also rose during this period--a development that would tend to reduce the rise in asset prices.

The average interest rate on outstanding farm debt, plotted in Chart 2, may be a fair indicator of the trend in capitalization rates employed by owners and buyers of farm land, as it likely reflects the trend in both the opportunity cost of investing in farm land and the cost of borrowing funds to purchase farm land. The average interest rate rose from about 5.5 per cent in the mid-1950's to about 7 per cent around 1970. Over the same interval, the relative residual return to production assets rose at about the same rate. Thus the difference between the rate of return and the probable opportunity cost or capitalization rate remained relatively constant over the period.

While the implications of the upward trend in returns to assets went largely unnoticed, the existence and persistence of this difference attracted substantial comment.[5] The most powerful explanation offered has been that the major buyers of farm land during this period--farmers

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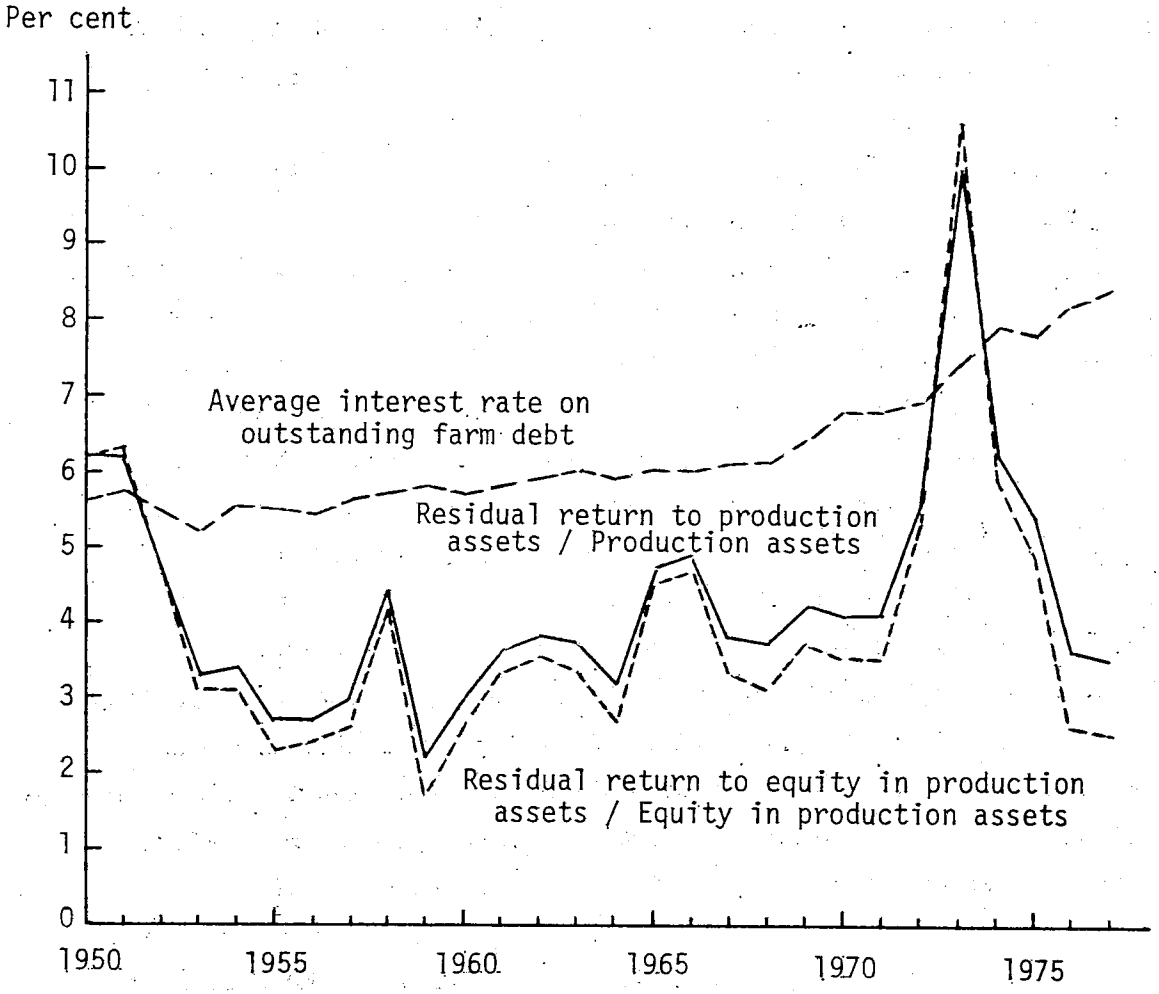
[5] Much of this discussion was couched in terms of the relative residual return to equity in production assets, as this ratio, rather than the return to assets, was being published by the USDA (see footnote 3). For convenience, the relative return to equity is also plotted in Chart 2.

Chart 2

Residual returns to farm assets and equity compared with average interest rate on farm debt



enlarging their own farms--were earning above-average returns.[6] For example, a comprehensive study has estimated that farms with sales of $100,000 or more in 1970 averaged a return to equity of 6.9 per cent--remarkably similar to the value of our indicator of opportunity cost--

[6] See, for example, "Theories Explaining the Persistence of Low Resource Returns in a Growing Farm Economy," by Luther G. Tweeten, American Journal of Agricultural Economics, November 1969, pp. 798-817, and "Land Returns and Farm Real Estate Values," by Albert A. Montgomery and Joseph R. Tarbet, Agricultural Economics Research, U.S. Department of Agriculture, January 1968, pp. 5-16.

while the average return of all farms was estimated as 2.1 per cent.[7] These large farms have been prominent purchasers of real estate for farm enlargement, and it is likely that their activities have been a major factor in determining farm land prices. Logically, therefore, farm real estate might be priced at the return achieved by these farms capitalized at their cost of borrowing funds.

Given these considerations, one might re-assess the relationships found between returns and asset values in 1976 and 1977. On the basis of the faulty indicators in Chart 1, relative returns in 1976-77 could be regarded as not far removed from their long-term downward trends. But the analysis illustrated in Chart 2 reveals that relative returns to assets in 1976-77 had fallen far below the values consistent with relationships that prevailed before the recent farm boom. In particular, the difference between the relative return to assets and the cost of borrowing (and also the probable opportunity cost) had widened to a remarkable and perhaps unsustainable degree.

This paper has emphasized that (1) returns to assets rose significantly during 1954-71 and that (2) the ratio of these returns to the market value of assets also rose, indicating (3) either that the rise in returns did not get fully capitalized or, more likely, that the capitalization rate rose along with interest rates generally. Before concluding, it might be useful to illustrate the effect of the capitalization process on rates of return. In Chart 3, the dashed line shows what the relative return to production assets would have been if farm real estate had not risen in price since 1954 while all returns and other prices are kept at the values actually experienced.[8] The solid line is the same as in Chart 2--the relative return to the market value of assets. Clearly, returns to farm assets have trended sharply upward since the late 1950's, and there is little need to look elsewhere to explain land price increases over most of this period.

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[7] Returns to Equity Capital by Economic Class of Farm, by J. Bruce Hottel and Robert D. Reinsel, Agricultural Economic Report No. 347, U.S. Department of Agriculture, August 1976.

[8] The price appreciation of real estate in production assets used in deriving this series is the estimated production-asset component (i.e., excluding operators' dwellings) of implicit nominal capital gains for real estate as computed for Table 543.1 of the Agricultural Finance Databook--Annual Series, Board of Governors of the Federal Reserve System.

Chart 3

Comparison of rates of return to farm asset values that exclude or include price appreciation of real estate since 1954