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June 1984

A.E. Res. 83-40

FARM WEALTH
ORIGINS, IMPACT, AND IMPLICATIONS
FOR PUBLIC POLICY

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Board of Governors of the Federal Reserve System

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Memorial Lecture

October 26, 1983

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FARM WEALTH: ORIGINS, IMPACT, AND IMPLICATIONS FOR PUBLIC POLICY

Emanuel Melichar

Over the past five years or so, studies of aggregate returns and capital gains in farming and, at the microeconomic level, comparisons of trends in farmland rents and prices, have helped to clear up much of the mystery that characterized earlier discussions of farm land prices. Changes in farm asset values were shown to have paralleled similar changes in income produced by those assets. The long-term uptrend in asset earnings, by logically fostering expectations of continued income gains, had led farmland to sell at a relatively low current yield--a result consistent with basic theory of asset pricing. After describing these relationships in 1979, I noted their "serious implications...for public farm policy." For example, "Policy actions that increase the growth rate [of income] will tend to depress the rate of current return to assets, and thus the problems they seek to address are eventually aggravated."

Although some financial analysts among agricultural economists have been discussing these income-wealth relationships for several years, their devastating implications for many popular views of farm profitability and farm policy are still not widely appreciated. The media, policymakers, and many economists frequently exhibit faulty

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impressions and interpretations of these key trends and relationships. Perhaps they and the public have been poorly served by the specialists in agricultural finance. It may be time to address more explicitly the policy implications that flow from financial considerations. In this spirit, I will explore the following theses:

- (1) In the 1960s, moderate additional farm wealth was created through capitalization of earnings growth that was, in part, induced by government programs.
- (2) During the 1970s, huge additional wealth was created when a boom level of earnings was capitalized at a relatively high multiple of those earnings, indicating that farmers expected further earnings growth.
- (3) Preservation of the new wealth requires continued earnings growth, which owners of farms will press to secure through greater sales, higher prices, or government assistance.
- (4) If farm supply-demand relationships are such that the required earnings growth is not produced, it is not in the public interest to help to preserve the huge additional wealth through government programs that make up the shortfall in earnings.

ORIGINS OF WEALTH: PRICING OF ASSETS

Before considering how public policy is involved with farm wealth, one should know how wealth is created. To introduce this subject, I will draw briefly on my earlier papers. In 1978, I pointed out that the earnings that USDA had estimated to be attributable to farm assets had risen just as much as land prices over the previous 25 years. Thus much of the increase in asset values since the mid-1950s could be explained by the proportional rise in earnings. And, both earnings and land prices--rather than only the latter--had risen considerably faster than the rate of general price inflation.

A year later, I pointed out that the price of an asset with a long-term earnings growth record such as that exhibited by farm real

estate should certainly reflect expectations that earnings growth will continue; that is, the growth model of asset pricing should apply.¹ Almost certainly, expectations of future earnings growth--which would be accompanied by proportional increases in asset prices--were an integral element in the pricing of farm land over recent decades. The arithmetic of the pricing of an asset with growing earnings is such that the asset sells at a relatively high multiple of the current level of earnings; or, stated inversely, that it sells to yield a relatively low rate of income return. Therefore--and though this seems astonishing at first encounter, it is perfectly logical--a primary reason for the relatively low rate of income return that has characterized farm assets since the mid-1950s is the relatively high longer-term growth posted by that income.

The arithmetic of the growth model of asset pricing is quite simple, because the rate of income growth and the rate of income return are additive and must sum to the total rate of return required by investors.² For example, if investors require a total return of 5 percent, an asset producing a stable income will be priced to yield an income return of 5 percent; that is, it will sell at 20 times earnings. But if, instead, the real earnings of the asset are rising by 3 percent annually--which means that its real price will also tend to be rising by 3 percent annually--then investors, in seeking the same total return of 5 percent,

^{1/} James C. VanHorne, Financial Management and Policy, Sixth Edition, Prentice-Hall, Inc., 1983, pp. 27-29.

^{2/} What determines the required total rate of return--the total rate of return that investors seek from farm land? That rate of return is set by the participants in the land market--by farmers and other buyers and sellers of land. They will set it as their bids and offers reflect their knowledge of the rates of return available on alternative assets, adjusted for differences in risk.

will price the asset to yield an income return of only 2 percent; that is, the asset will sell at 50 times earnings. The expected total rate of return will still be 5 percent--2 percent in the form of current income and 3 percent in the form of real capital appreciation.

This example also serves to provide a sense of the enormous power of wealth creation or destruction inherent in assets that are producing growing earnings. When an asset first moves, in the eyes of asset market participants, from stable to growing real earnings, the increase in its price-earnings multiple can produce relatively enormous windfall real capital gains for those who own it when that happens. Furthermore, if real earnings should take an unexpected quantum jump after the asset is already priced at a high multiple of earlier earnings, and the new level of earnings is capitalized at the same high multiple, then relatively enormous capital gains again occur (this is roughly what happened in farm land pricing during the 1970s).

Unfortunately for its owners, these two processes are just as powerful when they operate in reverse, producing relatively enormous real capital losses when real earnings stop growing or decline. Furthermore, economic history indicates that this event is inevitable--only its timing is uncertain. Even in the relatively short history of the United States, farm assets have repeatedly produced lengthy upward trends in earnings--some measured in decades--that were each reversed at a time that few owners foresaw.

Thus, when an asset is priced as a growth stock it can usefully be regarded as a monster that demands continual real earnings growth. This analogy should serve to remind its owners of the need to stay alert. As long as earnings grow in accordance with the expectations that underlie

its price-earnings multiple, the monster favors its owners with compounded accumulation of real capital gains. But growth in earnings never continues forever--it always stops well before one owns the entire world.³ If the monster is not fed its expected income growth, it soon turns on its owners. As the earnings-growth component is excised from asset value, recent or heavily indebted purchasers of the monster usually experience financial trauma.

GROWTH OF FARM INCOME AND WEALTH

Over the last three decades, aggregate earnings attributable to farm assets rose by about the same percentage as the average price of farm real estate. But for much of this time, many analysts were unaware of this relationship. Instead, beginning in the 1950s, their attention was focused on the relatively low level to which the rate of income return to assets had fallen. Twenty-five years later, in the late 1970s, the rate of income return was again at about the same level. But this means, of course, that the numerator of the ratio--income from assets--had risen just as much as the denominator--farm asset values that were dominated by land prices.

Such similarity in the upward trends of income from assets and of land prices was observed not only by analysts who studied the aggregate

^{3/} Back when savings accounts were paying 3 percent interest, a favorite mathematical exercise was to calculate the present value of \$1 invested in year 1 A.D. at 3 percent interest compounded quarterly. The answer is now about \$55,000,000,000,000,000,000,000, or slightly more than the present value of the entire Earth plus a few other minor planets and a solar system or two. Compounded continuously, one would now have about \$69,000,000,000,000,000,000,000,000. Obviously, wealth is continually being destroyed as well as created. Over the centuries, the growth rate of real wealth probably has not exceeded 1 percent.

returns,⁴ but also by analysts who compared cash rents with land prices.⁵ Many analysts, however, compared land prices only with the USDA series, "operators' net farm income," which was relatively stagnant. They thus concluded that land prices must have risen for reasons other than income

4/ As the 1960s began, USDA's land price specialists found that postwar "land income" was rising even though "operators' net farm income" was stagnant. In 1963, Gale wrote that although land prices had risen by 42 percent since 1952, "annual average net returns to farmers, after allowance for returns to labor and other factors, have been relatively stable at about 5 percent of the estimated yearly market value of all farm real estate," because "of the total net income from farming, ...the total return to land has become larger and the total return to unpaid labor has become smaller" (John F. Gale, "What Makes Farm Real Estate Prices," Agricultural Finance Review, June 1963, pp. 8-17). In each of the next two years, Scofield published an analysis of these relationships in Farm Real Estate Market Developments (FREMD). In the 1965 article, after refining his estimates of residual returns to real estate during 1935-64 by imputing a return to management as well as to labor and nonreal estate capital, he found that "while total net income per acre in 1964 was only 7 percent higher than in 1954...the percentage increase in per-acre returns [to real estate] has been 58 percent" (William H. Scofield, "Land Prices and Farm Earnings," FREMD, October 1964, pp. 39-53, and "Land Returns and Farm Income," FREMD, August 1965, pp. 44-54).

5/ Scofield (Ibid.) also studied the relationship of land prices to cash rents, stating that "cash rents for farms provide a more direct measure of the returns realized by landowners than do the imputed returns." In 1964 he found that "gross rents...have about kept pace with the rise in land prices during the last decade," and in 1965 he wrote that "rental rates...continued to advance at about the same rate as market values, as indicated by the almost constant ratios of gross rent to value." In 1973, Reinsel examined longer-term trends in cash rents and land values in several states and concluded "that a rather close relationship exists between rents and values in the more stable agricultural areas of the country" (Robert D. Reinsel, "Land Rents, Values, and Earnings," paper presented at the meeting of the American Agricultural Economics Association, August 1973). In 1981, Dobbins and others at Purdue, after examining rents and land prices in one region of Indiana during 1960-77, found "no evidence... [of] a statistically different rate of increase in land returns and land prices" (Craig L. Dobbins, et.al., The Return to Land Ownership and Land Values: Is There an Economic Relationship, Station Bulletin 311, Purdue University, February 1981). In the same year, Espel and Robison constructed a land-market model in which "cash rents are the major determinants of land values" (Thomas K. Espel and Lindon J. Robison, A Conversation Between Buyers and Sellers of Land, or, A Market Equilibrium Approach for Estimating Land Values, Agricultural Economics Report 403, Michigan State University, December 1981).

Table 1

Farm income, assets, and rate of income return

Year	Billions of 1983 dollars (using PCE deflator)		Rate of income return to assets (percent)
	Income from assets	Farm production assets	
1950...	15	428	3.6
1951...	21	455	4.6
1952...	16	464	3.4
1953...	8	446	1.9
1954...	6	443	1.3
1955...	9	451	1.9
1956...	9	462	1.9
1957...	8	473	1.7
1958...	15	501	2.9
1959...	6	519	1.2
1960...	12	516	2.3
1961...	13	525	2.4
1962...	12	540	2.1
1963...	13	554	2.3
1964...	9	567	1.5
1965...	14	590	2.4
1966...	15	612	2.5
1967...	13	630	2.0
1968...	10	638	1.5
1969...	13	640	2.1
1970...	12	636	1.8
1971...	13	645	2.0
1972...	25	688	3.6
1973...	55	768	7.1
1974...	36	790	4.6
1975...	28	811	3.5
1976...	16	892	1.8
1977...	15	956	1.6
1978...	27	1,032	2.6
1979...	30	1,112	2.7
1980...	15	1,130	1.3
1981...	26	1,081	2.4
1982...	15	1,002	1.5
1983...	21	960	2.1

Source: Appendix, Tables 101.1 and 112.1.

growth.⁶ But if rents and other income from assets on individual farms had generally increased, then aggregate income from assets had also risen

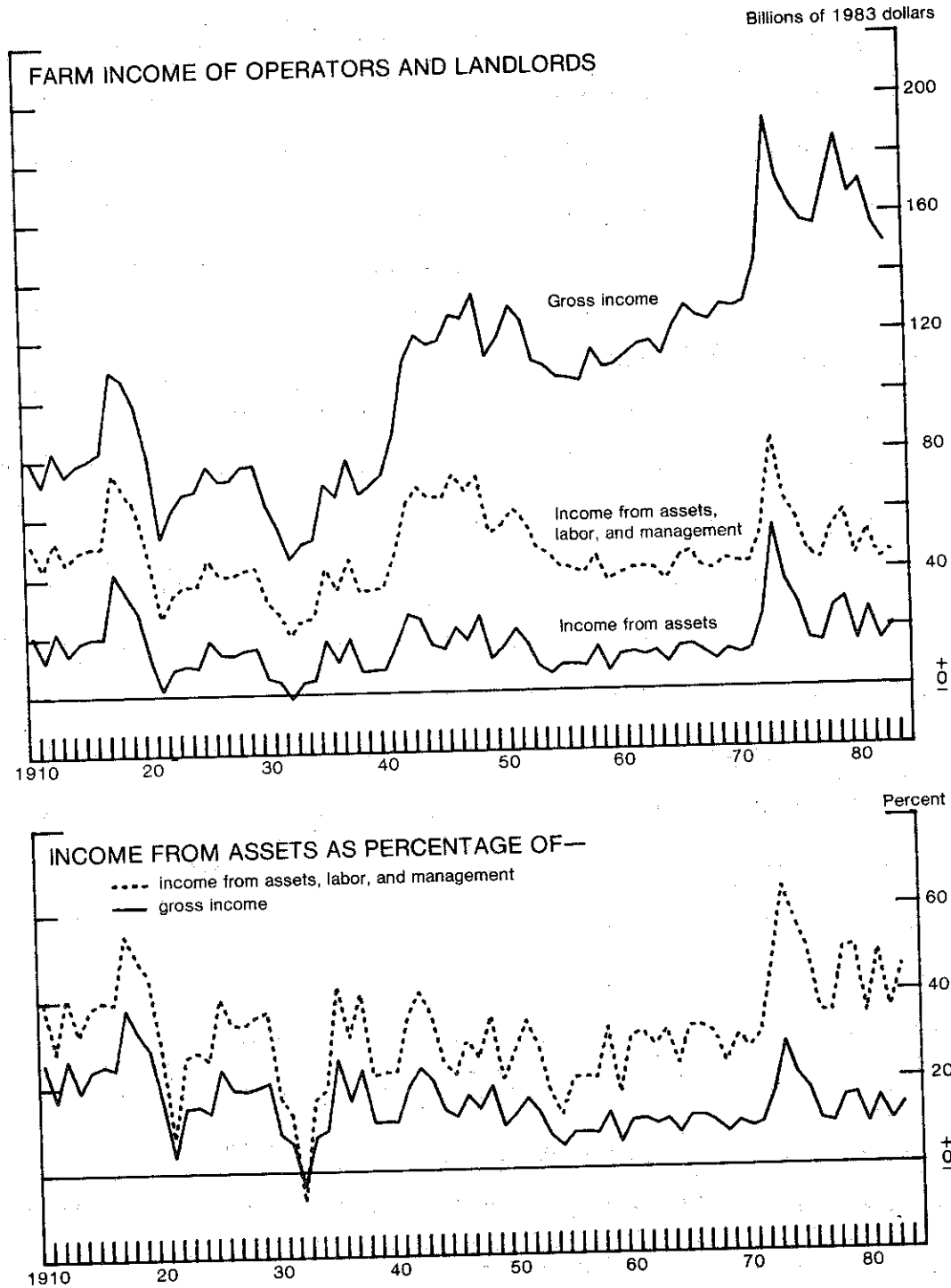
What error were these analysts making? In using "operators' net farm income" to measure earnings, they were looking at the sum of income from operators' labor, management, and equity, which was stagnant, rather than at income from assets, which had risen. In effect, they overlooked the impact of the ongoing reduction in labor requirements--often called the "substitution of capital for labor." As labor was reduced, more of the "operators' net farm income" was being earned by capital. Only the series that isolates the earnings of capital--income from assets--reveals the growth of such earnings. Chart 1 indicates that real income from assets is now substantially higher than in the mid-1950s, even though real total income is not much higher.

Income from assets

Chart 1 illustrates the two proximate factors underlying the longer-term upward trend that income from assets has shown since the Great Depression. The first factor is the increase in sales--rising real gross income. The second is the maintenance of profit margins as sales rose. Since the mid-1950s, income from assets has tended to represent an increasing percentage of the total income produced by the factors of production (dashed line, lower panel of Chart 1). In other words, profit margins were maintained because the decline in labor and management requirements offset increases in other operating expenses.

6/ Scofield also set the tone for much postwar land price commentary and analysis when, in 1957, he referred to the "seeming paradox" of land prices rising in the face of stagnant or declining income and offered a laundry list of possible nonincome influences (William H. Scofield, "Prevailing Land Market Forces," Journal of Farm Economics, December 1957, pp. 1500-10).

Chart 1



Source: Table 112.1

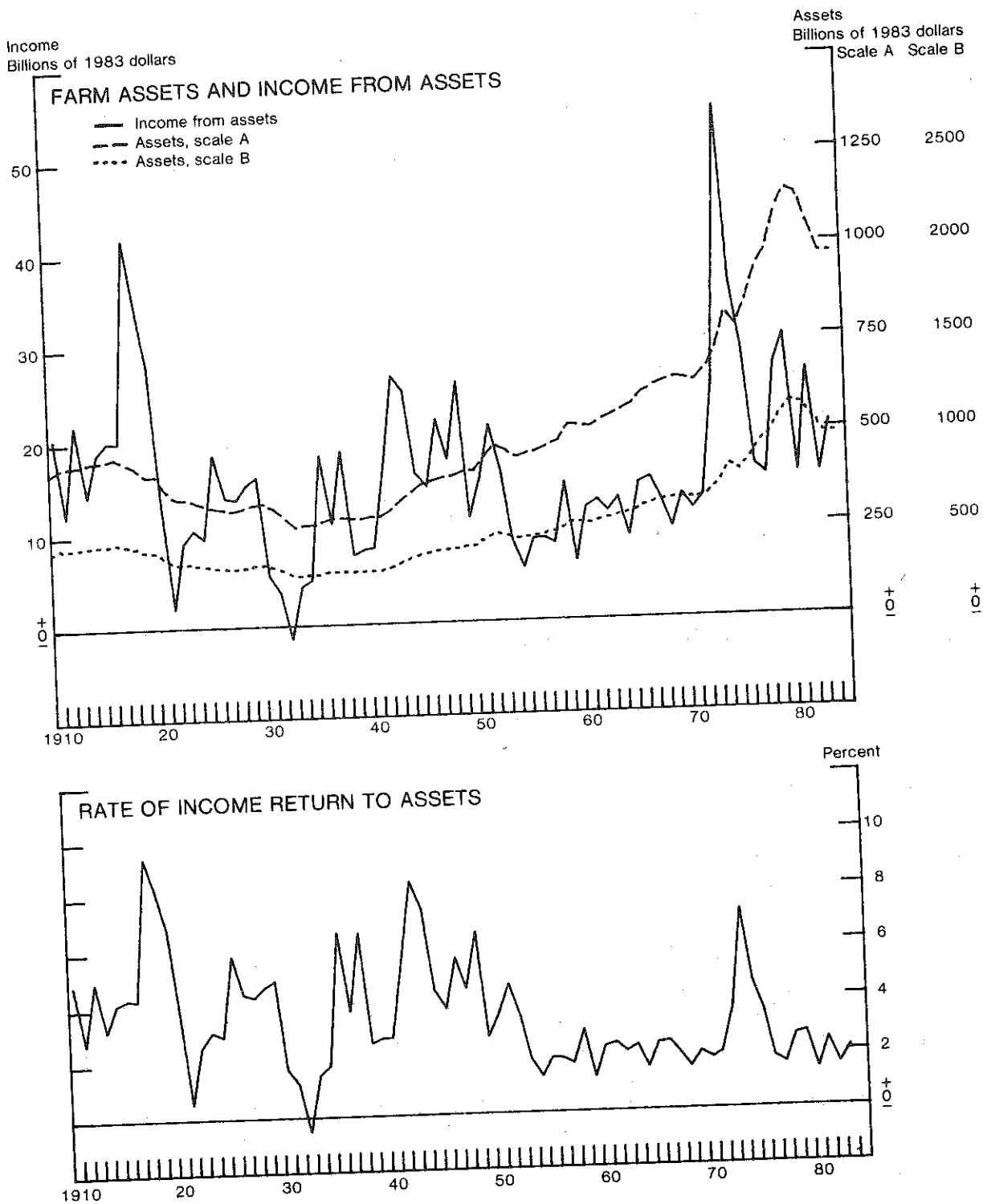
Real income from assets is plotted again as the solid curve in Chart 2. On the scale used for income in this chart, the growth of earnings during the period from 1954 to 1971 is more clearly visible than it was in Chart 1. During this period, the annual growth rate of real income from assets averaged 3 percent; that is, the rate of increase in nominal income from assets was about 3 percentage points above the general inflation rate. Note, however, that this respectable record of real growth was later dwarfed by the earnings explosion of the 1970s.

Income-asset relationships

Chart 2 is designed for study of the response of farm asset values to changes in the earnings of those assets. Because farm land was valued at a much lower average multiple of earnings before the 1950s, the value of farm assets is plotted twice. The first plot is the long-dash curve using Scale A, which is set at 25 times the scale for income; thus, when this asset curve and the income curve are at the same level, farm assets are valued at 25 times earnings. As shown, this was approximately the average price-earnings ratio from 1910 through 1952. Therefore, as the lower panel indicates, the rate of income return to assets fluctuated around an average of about 4 percent during that period.

Assets are plotted a second time as the short-dash curve using Scale B, which is set at 50 times the scale for income. Note that this was approximately the average price-earnings ratio over the last thirty years. During this period, therefore, the rate of income return to assets averaged about 2 percent.

Chart 2



Source: Tables 101.1 and 112.1

FARM WEALTH AND PUBLIC POLICY

Chart 2 indicated two distinct periods of growth in farm wealth since the Korean War: 1954-71 and 1972-79. Table 2 shows the annual capital gains in these periods, as well as their total in each cyclical swing. The data in this table are, in billions of 1983 dollars, the amounts by which the increase in the value of farm production real estate exceeded the sum of net real estate improvements plus the capital appreciation needed to keep pace with general price inflation. This remaining portion of capital appreciation--the capital appreciation in excess of net investment and general inflation--is called real capital gains. It has been the main component of growth in real farm wealth, greatly exceeding the contribution of net investment.

Policy and the growth of wealth: the 1960s

In the 1960s the government was operating, and thus consumers and taxpayers were supporting, programs intended to improve farm income. To many observers, however, these programs appeared to be relatively ineffective, because "operators' net farm income" was stagnant and the rate of income return to equity remained relatively low. As already noted, however, real income from assets and real land prices were in reality both rising gradually; hence, real income and wealth were both improving. Thus agricultural real estate was exhibiting, to a moderate degree, the classic characteristics of a growth stock: (a) the real income it produced was rising; therefore, (b) its value was rising in proportion; and (c) its rate of income return was relatively low because its value reflected expectations that the income would continue rising.

Table 2

Real capital gains on farm real estate (excluding operators' dwellings)
(Billions of 1983 dollars, using PCE deflator)

1952.....	-3
1953.....	-8
1954.....	10
1955.....	11
1956.....	14
1957.....	8
1958.....	21
1959.....	8
1960.....	-3
1961.....	12
1962.....	8
1963.....	15
1964.....	17
1965.....	18
1966.....	10
1967.....	11
1968.....	2
1969.....	-8
1970.....	-1
1971.....	18
1972.....	40
1973.....	72
1974.....	30
1975.....	61
1976.....	90
1977.....	42
1978.....	69
1979.....	42
1980.....	-3
1981.....	-64
1982.....	-78
1983.....	-3

Cyclical summary:

1952-53...	-11
1954-59...	72
1960.....	-3
1961-68...	93
1969-70...	-9
1971-79...	465
1980-83...	-149

In this period, it appears that public farm policy contributed significantly to establishing the conditions that fostered growth in income from assets, and hence growth in asset values. Farm productivity was rising sharply, reducing unit costs of production. Thus unit sale prices of farm products would also have tended to fall, but such declines were slowed or prevented by government price support programs. The combination of falling unit costs and steadier unit sale prices resulted in rising income from assets, and hence in rising land prices.⁷

In establishing programs that would increase farm income, policymakers appeared to believe that the rate of return to farm assets would also increase. But this could not be the outcome, once enough time had elapsed for the land market to react to the change in income. As already noted (footnote 2), programs cannot alter the total rate of return,⁸ which is set by farmers themselves in the land market. However, by instituting programs that helped to establish a rising trend in real current income from farm assets, government actions did alter the relative composition of the total return. Because the asset market recognized that income was growing, the rising total return consisted of real capital gains as well as the rising current income.

7/ Chryst presented a theoretical argument for this joint effect of technological advance and price supports, and Herdt and Cochrane successfully used the effect to explain changes in land prices, although they had an incorrect conception of how it operated (fn. 9). (Walter E. Chryst, "Land Values and Agricultural Income: A Paradox?" Journal of Farm Economics, December 1965, pp. 1265-73; Robert W. Herdt and Willard W. Cochrane, "Farm Land Prices and Farm Technological Advance," Journal of Farm Economics, May 1966, pp. 243-63.)

8/ Assuming, as usual, "other things equal," including risk. But if government programs, by tending to stabilize income, also reduce risk, participants in the land market would probably regard this as a favorable development, and would set a lower total rate of return--another logical result (it may seem paradoxical, but is not) that may disappoint some advocates of the programs.

From 1961 through 1968, as shown in the summary in Table 2, real capital gains on farm real estate (excluding operators' dwellings), in 1983 dollars, totaled \$93 billion. Increased real income led to this result--the rise in asset values resulted from and was roughly proportional to the rise in income. Proportional increases in income and in asset values meant that the rate of income return to assets did not change.

Very likely, policymakers would have preferred a different outcome. The unchanged low rate of income return enabled farmers to claim that farming was as "unprofitable" as ever, and continued to make things very difficult for beginning farmers and others who needed a higher income return to cover basic family living expenses. Suppose, however, that the farm policy goal of the 1960s is restated. Instead of seeking to raise the rate of return--which could not be done because it is determined in the land market--consider the more limited, but feasible, goal of raising the income of persons who are already the owners of farm assets. This goal was accomplished. Their income was raised, at a cost in part of less food at higher prices, borne by consumers worldwide, and in part of government outlays, borne by U.S. taxpayers.

As just described, increased earnings for farm owners necessarily increased their wealth as well, because assets which produce more income have greater value. Very roughly, during the 1960s the identical farm that had been worth \$200,000 producing annual asset earnings of \$4,000 became, in constant dollars, a \$250,000 farm producing \$5,000. The commensurate increase in farm wealth was an integral and unavoidable part of the process that raised farm earnings and living levels. Thus it is nonsense to lament the capitalization of income gains. At best,

that complaint mistakenly implies that capitalization was either unexpected or avoidable; at worst, it mistakenly implies that the income gains were negated by the higher "cost" of farm assets.⁹

What consequences does a rise in real farm wealth have for future years, for future generations of consumers? To be preserved, the added wealth demands in future years a return that is large enough, on average, to provide a rate of return equal to the required rate of return then prevailing among buyers and sellers of farms. If, for example, the required rate of return is 5 percent, then nearly \$5 billion per year in additional income from assets (in 1983 dollars) is required to preserve the real wealth gain of the 1960s. Such additional income that preserves the added wealth must be provided by purchasers of food. If, in some future period, commodity markets fail to produce such

^{9/} Greater farm wealth is an added "cost" for future buyers of farms, but not for present owners and their heirs. While both present owners and future buyers receive the higher income flowing to the greater wealth, the future buyers will have paid more for the asset. Unfortunately, it appears that some observers who lamented the capitalization of farm program benefits had made a horrendous analytical error: upon seeing that "operators' net farm income" was flat while land values were rising, they mistakenly concluded that capitalization had somehow vaporized the underlying income gains. Brun exemplified that delusion most explicitly when he wrote that "...farmers will be prospective buyers of additional land in the hope of an increasing income per hectare, but...due to the competition on the land market, they will never succeed in achieving this increase of income. ...The simultaneous occurrence of new techniques and of price supports is sufficient to provoke a rising trend in land values without an increase of the net income per acre" (Andre Brun, "The development of agricultural land prices and ownership," European Review of Agricultural Economics, Volume 1-3, 1973, pp. 258-259). Brun made these observations in reporting the findings of Herdt and Cochrane (op. cit., fn. 7), who had a faulty conception of the capitalization process and thus did not appreciate that, in explaining why land prices were rising, they had also explained why land income and rents were increasing. Instead, seemingly unaware of Scofield's work (fn. 4 and 5), and knowing that net farm income was not rising, they were convinced that they were dealing only with income gains that were merely "expected" increases which vanished when capitalized.

income, the wealth is jeopardized. Its owners may then look to government programs--which helped to create this wealth--for help in preserving it.

Policy and the growth of wealth: the 1970s

While the increase in farm wealth prior to the 1970s may be viewed as part of the process by which farm living levels were deliberately raised toward comparability with average urban levels, no such benign attitude appears appropriate toward the events and results of the 1970s. Initially, enormous gains in earnings of crop producers resulted from market forces propelled by foreign droughts and the U.S. drought of 1974, a drop in the exchange value of the dollar, and rising incomes around the world. Land prices responded both to ongoing gains in profitability and to strong expectations of continued future gains.

As Table 2 shows, from 1971 through 1979 real capital gains on farm production real estate, in 1983 dollars, totaled \$465 billion. If considered as distributed among 2.4 million farms, wealth rose by an average of \$200,000. More realistically, much of the gain occurred on less than 1 million farms, on which the average gain was perhaps \$400,000. If the required rate of return is 5 percent, \$23 billion in additional annual income from assets (in 1983 dollars) would be required to preserve this mammoth increase in real wealth. Here, in truth, was created a monster to be fed in each succeeding year by buyers of food.

If the greater earnings that triggered farm wealth creation in the 1970s arose mainly from a permanently tighter worldwide supply-demand relationship for food--a result, perhaps, of greater demand colliding with inherently greater difficulty in increasing supply--then the annual earnings required to sustain the increased wealth would continue

to be provided by purchasers of food through the routine operation of commodity markets. Persons who owned farm assets in the 1970s appropriately could continue to be congratulated on their foresight or good fortune in selection of investment or occupation.

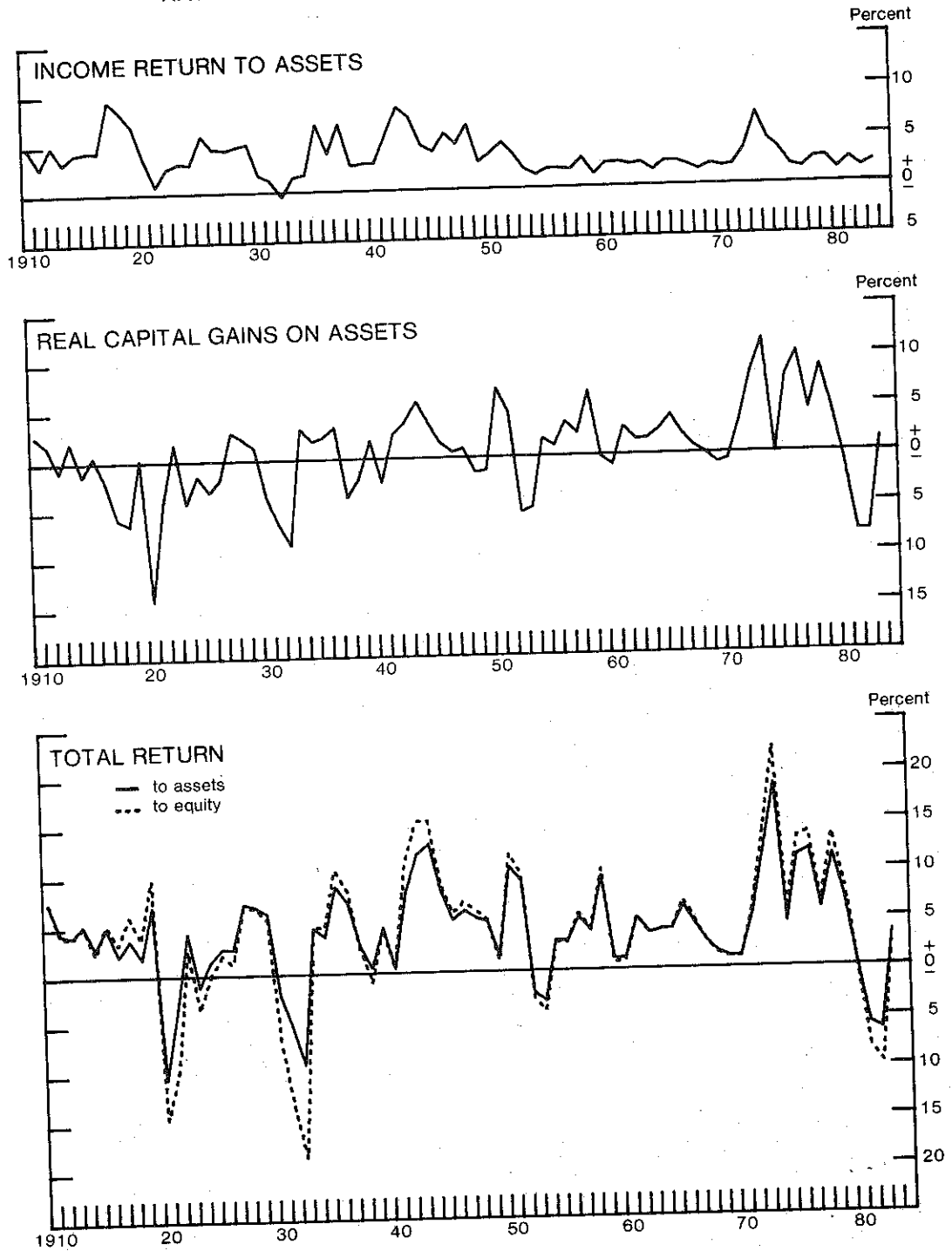
If, however, the gains in earnings and wealth resulted in large part from events that turned out to be temporary--which may be the case if supply-demand conditions experienced so far in the 1980s prove representative of future norms--then those gains also should be in large part temporary. In this case, therefore, pleas for public programs to restore earnings nearer to their boom levels should be resisted. Otherwise, we would have a truly astonishing result: a couple of droughts in Russia create a very large new wealthy class in the United States, and its wealth is henceforth sustained indefinitely by public programs that either produce higher food prices than otherwise would have prevailed or, through an assortment of mechanisms, transfer public funds to farmers.

Policy and falling wealth: the 1980s

During 1980-83, real capital losses on farm production real estate, in 1983 dollars, totaled \$149 billion. Thus the size of the monster remaining as a legacy of the 1970s has been reduced by one-third, to about \$300 billion.

As their new wealth has been threatened by lower earnings, owners of farm assets have strived in various ways to preserve their gains, including the instigation of public programs toward that end. One cannot fault the owners of these assets for making such efforts. But the public and its policymakers need not succumb to their entreaties. For instance, appeals to the sympathies and sensibilities of the public are

Chart 3
RATES OF RETURN TO FARM ASSETS AND EQUITY



Source: Table 101.1

legitimate tactics, but policymakers who understand the underlying financial processes may find that the broader public interest is served by resisting many such pleas. For guidance in these matters, policymakers, the media, and the public look to analysts in government and at agricultural colleges; unfortunately, a goodly number of these analysts need to update their own understanding and interpretation of financial processes and events in agriculture.

In retrospect, the scope of post-boom financial problems might have been reduced by a firmer farm policy stance in the mid-1970s. Over half of the real capital gains of that decade--\$243 billion of the \$465 billion--arose in 1976-79. President Ford and his advisers were on the right track in 1975, when he vetoed a bill that would have raised farm price support levels substantially. If this policy stance had been maintained, further land price advances might have been restrained by the specter of more pronounced valleys in commodity price cycles. But the Ford administration later raised price supports just before the 1976 election. Having promised higher supports during his campaign, President Carter soon raised them again. Land prices continued to escalate and by 1979 they fully capitalized both a level of income that was not to be sustained in following years and expectations of income growth that were not to be fulfilled. If the rise in land prices had been moderated by allowing farm prices and income to drop lower in the mid-1970s, there might now be less financial trauma among farmers.¹⁰

^{10/} As is typical, post-boom financial stress has been concentrated among farmers who incurred relatively heavy debt during the final stages of the boom. In this post-boom period, however, the relative size of this group and the magnitude of its problems have been greatly increased by a huge rise in interest rates. Problems of indebted farmers and the condition of rural banks are discussed in a forthcoming article, "A Financial Perspective on Agriculture," in the January 1984 issue of the Federal Reserve Bulletin.

Meanwhile, as Chart 2 vividly indicated, farm land still appears to carry the price-earnings multiple of a growth stock. This means that pressures to achieve earnings growth remain, and that a fundamental readjustment of land values awaits at the eventual end of earnings growth. At some point--which could be at hand or might not occur for decades--the long-term uptrend in earnings inevitably will end. As farmers become aware and convinced of its probable demise, farm land will be revalued to produce a higher rate of income return. This will help with some farm problems, such as the need of beginning farmers for a higher rate of return in the form of current income. But because the only way to get from a low to a higher rate of income return is through a drop in real asset values, further financial difficulties can be expected during this process. While it is possible that this period has arrived, recent experience can still prove to have been just an unusually prolonged cyclical downturn in a continuing longer-term uptrend.

In summary, what is the message of the foregoing financial analysis for public policy? From the viewpoint of the general public interest rather than from that of the special interest of present owners of farms, the analysis provides little support for public programs that would, by using public funds to replace farm income no longer forthcoming from commodity markets, perpetuate the wealth created during the recent farm boom. If a lower level of earnings continues to be the outcome of long-term supply-demand relationships, policymakers and the public should not feel bad, as they now often seem to, about putting limits on public aid to the farm sector.

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APPENDIX

Sources of data

Data used in this paper are for the farm sector excluding farm households; that is, the data exclude operators' dwellings, household equipment and furnishings, and all financial assets except currency, bank demand deposits, and stock in farmers' cooperatives. The data used are primarily USDA series published in Economic Indicators of the Farm Sector, Income and Balance Sheet Statistics, 1982, ERS ECIFS 2-2, October 1983, adjusted for inflation as described below. Farm income and expense data for 1983 and farm asset and debt data for January 1, 1984 are primarily midpoints of USDA projections published in the August and September 1983 issues of Agricultural Outlook and additional estimates consistent with these projections. Asset and debt data for 1910-1939 are based on series published by Alvin S. Tostlebe in Capital in Agriculture: Its Formation and Financing Since 1870, Princeton University Press, 1957, and series in Historical Statistics of the United States, Colonial Times to 1970, U.S. Bureau of the Census, 1975.

Adjustment for price level changes

Data adjusted for changes in the general level of prices are shown in dollars of 1983 purchasing power, using the implicit price deflator for personal consumption expenditures (PCE). The PCE deflator is also used in calculating real capital gains. Deflator values for the second half of 1983 and for January 1, 1984 are estimated. Deflator values for January 1 are estimated

as the average for the two adjoining quarters (for 1929-1945, the two adjoining years). For years before 1929, the deflator used is the Consumer Price Index (CPI) adjusted to the level of the PCE deflator in 1929.

As an indicator of the impact of price changes on farm family living expenditures, the PCE deflator is superior to the CPI, which has fixed weights and also has overstated the rate of inflation faced by most households during periods of rising interest rates. The PCE deflator is also superior to the GNP deflator, to which many agricultural economists have resorted, because the latter includes such irrelevant and potentially troublesome components as the prices of military hardware and business plant and equipment and the salaries of federal civilian and military employees.

Derivation of "income from assets"

"Income from assets" measures the net income produced by farm assets, regardless of their ownership and method of financing. Thus, payments of rent and interest are not subtracted when such income is computed; on the other hand, income attributable to the labor and management work of farm operators and their families must be estimated and subtracted.

The derivation of income from assets is shown in Table 112.1. The computation starts with gross farm income, from which nonfactor operating expenses are subtracted to obtain cash flow from the factors of production (labor, management, and assets). Next, estimated capital consumption--depreciation and accidental damage of assets--is subtracted to obtain net income from the factors. When payments to hired labor are also subtracted, the

Table 101.1
Farm Assets, Debt, Equity, and Rates of Return to Assets and Equity

Year	Amounts, annual average (billions of dollars)						Rates of return to assets (percent)			Cost of outstanding debt (percent)			Rate of total return to equity (percent)
	Current dollars			1983 dollars, PCE deflator			Income	Real capital gains	Total	Interest	Real capital gains	Total	
	Assets	Debt	Equity	Assets	Debt	Equity							
1950...	114	11	103	428	43	385	3.6	7.0	10.6	4.9	5.7	-9	11.9
1951...	129	12	117	455	44	412	4.6	4.4	9.1	5.3	3.6	1.6	9.8
1952...	135	14	121	464	47	417	3.4	-5.7	-2.2	5.2	2.0	3.3	-2.9
1953...	132	15	117	446	50	396	1.9	-5.1	-3.2	4.9	1.2	3.7	-4.0
1954...	132	16	117	443	52	391	1.3	1.8	3.1	4.7	.3	4.4	2.9
1955...	136	16	119	451	55	396	1.9	1.0	3.0	4.8	1.4	3.4	2.9
1956...	142	17	125	462	56	406	1.9	3.5	5.3	5.0	3.0	2.0	5.8
1957...	150	18	132	473	56	417	1.7	2.2	3.9	5.1	2.9	2.3	4.2
1958...	162	20	142	501	62	439	2.9	6.5	9.5	5.1	1.2	3.9	10.3
1959...	172	22	150	519	67	452	1.2	-2	1.0	5.2	2.2	3.0	.7
1960...	174	23	151	516	69	447	2.3	-1.1	1.3	5.5	1.6	3.9	.9
1961...	179	25	154	525	73	452	2.4	2.8	5.3	5.4	.8	4.6	5.4
1962...	186	27	159	540	79	461	2.1	1.5	3.7	5.4	1.7	3.7	3.6
1963...	194	30	164	554	86	468	2.3	1.7	4.0	5.5	1.4	4.1	4.0
1964...	202	33	169	567	92	476	1.5	2.6	4.1	5.5	1.1	4.4	4.1
1965...	213	35	178	590	98	492	2.4	3.9	6.4	5.6	2.2	3.4	7.0
1966...	228	39	189	612	104	508	2.5	2.1	4.5	5.7	2.8	2.9	4.9
1967...	240	42	198	630	110	520	2.0	.7	2.8	5.9	2.8	3.0	2.7
1968...	253	45	208	638	114	524	1.5	.0	1.6	5.9	4.0	1.9	1.5
1969...	265	48	217	640	115	525	2.1	-9	1.1	6.1	4.6	1.5	1.0
1970...	275	50	226	636	115	521	1.8	-6	1.3	6.4	4.3	2.2	1.1
1971...	292	53	239	645	117	528	2.0	3.4	5.5	6.4	3.7	2.7	6.1
1972...	322	58	264	688	123	565	3.6	8.2	11.7	6.3	3.6	2.7	13.7
1973...	380	64	316	768	130	638	7.1	11.5	18.6	6.9	7.4	-5	22.4
1974...	431	72	359	790	132	658	4.6	-1	4.5	7.5	9.2	-1.6	5.7
1975...	476	80	396	811	137	674	3.5	7.8	4.5	7.5	5.4	2.1	13.2
1976...	550	91	459	892	147	745	1.8	10.1	11.9	7.7	4.7	3.0	13.7
1977...	624	106	518	956	162	794	1.6	4.3	5.9	7.7	5.2	2.5	6.5
1978...	721	123	598	1032	176	856	2.6	8.8	11.4	7.9	7.4	.5	13.6
1979...	847	143	703	1112	188	924	2.7	4.3	7.0	8.7	8.6	.2	8.4
1980...	948	162	785	1130	194	936	1.3	-9	.4	9.6	9.0	.6	.4
1981...	983	179	804	1081	197	884	2.4	-8.3	-5.8	10.7	6.5	4.2	-8.1
1982...	964	196	768	1002	203	799	1.5	-8.0	-6.5	10.7	4.3	6.4	-9.8
1983...	960	202	759	960	202	759	2.1	.4	2.5	10.3	4.0	6.3	1.5

result is the net income of operators and landlords from their farm assets, labor, and management (not shown in Table 112.1, but plotted in Chart 1).

The final step in derivation of income from assets is to estimate and subtract the imputed value of labor and management work performed by farm operators and unpaid family workers; that is, the income these persons would have received for their work if they had been paid the wage rates and fees that farm laborers and management firms received for such services. Because published USDA estimates of such imputed labor income are substantially understated, an interim series estimated by the author is shown in Table 112.1 and used in this paper. The need for and estimation of the interim series are discussed in a later section.

Derivation of total returns from assets and equity

"Total return from assets" is the sum of income from assets plus real capital gains on assets. Because the price of farm assets has reflected expectations of future income growth and hence real capital gains, those gains must be included in computations of the return that the assets have produced for their buyers and owners. The derivation of real capital gains is described in the last section of this appendix.

"Total return from equity" is total return from assets less interest paid, plus real capital gains on debt; that is, total return from assets less the real cost of borrowed funds.

Note that "income return from equity," featured in USDA presentations of returns, is not shown in this paper. To obtain that series, all of the interest paid is subtracted from the

Table 112.1
Farm Income, Cash Flow, and Returns from Assets and Equity
1983 Dollars, PCE Deflator
Amounts in billions of dollars

Year	Gross income	Less:		Equals:		Less:		Equals:		Less:		Equals:		Plus:		Less:		Equals:	
		Nonfactor operating expenses	Cash flow from labor, management, & assets	Capital consumption	Income from labor, management, and assets	Hired labor	Income imputed to operators'	Labor Management	Income from assets	Real capital gains on assets, PCE basis	Total return from assets	Interest on debt	Real capital gains on debt, PCE basis	Total return from equity					
1950...	120	44	76	9	67	11	36	5	15	30	45	2	2	2	46				
1951...	130	49	82	10	72	10	36	5	21	20	41	2	2	2	41				
1952...	125	48	77	10	67	9	36	4	16	-26	-10	2	1	1	-12				
1953...	111	43	68	10	58	9	36	4	8	-23	-14	2	2	0	-16				
1954...	110	44	65	10	55	9	36	4	6	8	14	2	0	0	11				
1955...	106	45	61	11	51	9	29	4	9	5	13	3	1	1	11				
1956...	105	45	61	11	50	9	28	4	9	16	25	3	2	2	24				
1957...	105	46	59	11	48	9	27	4	8	10	19	3	2	2	17				
1958...	115	50	65	11	54	9	27	4	15	33	47	3	1	1	45				
1959...	109	52	57	11	46	9	27	4	6	-1	5	3	1	1	3				
1960...	110	50	60	11	48	9	23	4	12	-5	7	4	1	1	4				
1961...	114	52	62	11	50	9	24	4	13	15	28	4	1	1	24				
1962...	117	55	62	11	51	10	25	4	12	8	20	4	1	1	17				
1963...	118	56	62	12	50	10	23	4	13	9	22	5	1	1	19				
1964...	113	54	59	12	47	10	24	4	9	15	23	5	2	2	34				
1965...	123	56	66	12	54	10	25	5	14	23	38	6	3	3	25				
1966...	129	60	69	12	56	10	27	5	15	13	28	6	3	3	14				
1967...	126	62	64	13	51	10	24	5	13	5	17	6	3	3	8				
1968...	124	61	64	13	50	10	26	5	10	0	10	7	5	5	5				
1969...	129	62	68	14	54	10	26	5	13	-6	7	7	5	5	5				
1970...	129	63	66	14	52	10	26	5	12	-4	8	7	5	5	6				
1971...	130	64	66	14	52	10	25	5	13	22	35	7	4	4	32				
1972...	145	68	77	14	63	10	23	5	55	88	81	8	4	4	77				
1973...	192	81	111	15	95	10	23	7	36	143	143	9	10	10	143				
1974...	172	80	91	16	75	11	21	6	28	-1	35	10	12	7	38				
1975...	163	77	86	18	68	11	22	6	16	64	107	11	7	7	102				
1976...	157	81	76	19	57	12	23	6	15	91	107	12	8	8	52				
1977...	156	80	75	20	55	12	22	6	17	90	56	14	13	13	116				
1978...	171	84	87	21	66	12	21	7	27	90	117	16	16	16	78				
1979...	186	92	93	21	72	13	22	7	30	48	78	16	16	16	78				
1980...	166	89	77	21	56	12	22	6	15	-10	5	19	17	17	4				
1981...	171	85	86	21	64	11	20	7	26	-89	-63	21	13	13	-71				
1982...	156	80	76	21	55	13	21	6	15	-80	-65	22	9	9	-78				
1983...	149	74	76	19	57	12	19	6	21	4	24	21	8	8	12				

income from assets, ignoring real capital gains on both assets and debt. As noted by Hottel and Gardner, when borrowed funds are used to finance assets that are expected to produce both income and capital gains, it is misleading to charge all of the interest against the income return and thus exaggerate the relative importance of capital gains in the total return.¹¹ On the other hand, the capital gains are a relatively illiquid form of return, except as they may support additional borrowing; thus, in computing the flow of spendable funds, it is appropriate to subtract interest from cash flow, as is done in Table 122.1.

Imputed value of operators' labor

Estimates shown for returns to assets and equity differ from those in ECIFS because a different procedure was used to estimate the imputed value of labor provided by operators and unpaid family workers, shown in Table 112.1. In the USDA procedure, this series is obtained by subtracting expenditures for hired labor from the product of manhours required in farm production times the hired labor wage rate. While conceptually sound, this procedure yields increasingly flawed results in recent years, understating the imputed value mainly because the manhours are understated, and perhaps also because expenditures for hired labor are overstated. The flaw is revealed by comparing the implied percentage of total farm work performed by hired labor with other estimates of this ratio. Even though the latter estimates are not

^{11/} J. Bruce Hottel and Bruce L. Gardner, "The Rate of Return to Investment in Agriculture and Measuring Net Farm Income," American Journal of Agricultural Economics, August 1983, pp. 553-557.

Table 122.1
Amount and Disposition of Funds from Farm Cash Flow and Borrowing
1983 Dollars, PCE Deflator
Amounts in billions of dollars

Year	Gross income	Less:		Equals:		Cash flow after interest	Plus:		Equals:		Less:			Equals:	
		Nonfactor operating expenses and hired labor	Cash flow to operators and landlords	Interest paid	Cash flow after interest		Net borrowing	Funds for investment, transfers, and nonfarm uses	Farm investment		Funds for farm transfers and nonfarm uses	Capital expenditures	Additions to inventories	Buildings	Machinery
									Buildings	Machinery					
1950...	120	55	65	2	63	5	68	3	12	3	50	3	12	3	50
1951...	130	59	71	2	69	6	75	3	12	5	56	3	12	5	56
1952...	125	58	67	2	65	3	67	3	10	3	50	3	10	3	50
1953...	111	53	59	2	56	-1	55	3	11	-2	43	3	11	-2	43
1954...	110	53	57	2	54	3	57	3	9	2	42	3	9	2	42
1955...	106	53	53	3	50	5	54	3	9	1	43	3	9	1	43
1956...	106	54	52	3	49	3	52	3	8	2	39	3	8	2	39
1957...	105	54	50	3	47	4	51	3	8	3	44	3	10	3	44
1958...	115	59	56	3	53	6	59	3	10	3	44	3	10	3	44
1959...	109	61	48	3	45	7	52	3	10	0	38	3	10	0	38
1960...	110	60	50	4	47	3	50	4	8	1	37	4	8	1	37
1961...	114	61	52	4	48	5	53	3	8	1	40	3	8	1	40
1962...	117	64	53	4	48	7	56	4	9	2	41	4	9	2	41
1963...	118	66	52	5	48	8	56	4	10	2	40	4	10	2	40
1964...	113	64	49	5	44	8	51	4	11	-2	39	4	11	-2	39
1965...	123	66	56	5	51	10	61	4	12	3	43	4	12	3	43
1966...	129	70	59	6	53	9	62	4	13	0	46	4	13	0	46
1967...	126	72	54	6	48	8	56	4	11	2	36	4	11	2	36
1968...	124	70	54	7	47	4	51	4	11	0	35	4	11	0	35
1969...	129	72	58	7	51	6	57	4	11	0	41	4	11	0	41
1970...	129	73	56	7	49	5	54	4	11	0	38	4	11	0	38
1971...	130	74	56	8	49	10	59	4	11	3	41	4	11	3	41
1972...	145	77	67	8	59	12	71	4	12	2	53	5	12	2	53
1973...	192	92	100	9	91	18	109	5	15	7	82	5	15	7	82
1974...	172	91	80	10	70	15	85	6	15	-3	67	6	15	-3	67
1975...	163	88	75	10	64	16	80	6	16	6	53	6	16	6	53
1976...	157	93	64	11	53	18	71	7	18	2	48	7	18	2	48
1977...	156	93	63	12	51	22	73	7	22	1	56	7	18	1	56
1978...	171	96	75	14	61	23	83	7	23	6	63	7	19	6	63
1979...	186	105	81	16	64	31	95	6	31	6	50	7	19	6	50
1980...	166	101	65	19	46	18	65	6	18	-6	43	6	15	-6	43
1981...	171	96	74	21	53	17	70	5	17	8	36	5	13	8	36
1982...	156	92	63	22	41	7	49	4	7	-2	41	4	10	-2	41
1983...	149	85	64	21	44	4	47	4	4	-7	36	4	10	-7	36

thought to be highly reliable, the comparison nevertheless provides convincing evidence that imputed operators' labor has been increasingly understated:

Percentage of farm work performed by hired labor

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1982</u>
Implied by USDA imputation procedure.....	32	44	66	73
Manhours series, USDA.....	23	24	35	32
Manhours series, BLS household survey.....	26	26	33	35
Employment series, USDA.....	27	26	35	35
Employment series, BLS household survey.....	29	30	36	38

As an interim measure pending the indicated revision of the USDA estimates, imputed operators' labor in Table 112.1 is estimated by using ratios as shown above from the USDA employment series (1910-46) and BLS manhours series (1947-83), with each adjusted (arbitrarily, by 10 percent) for probable overreporting of employment and hours of operators and unpaid family workers. The difference between this interim series and the present USDA series is substantial in recent years, and the income return to assets is correspondingly lower than the USDA estimate:

Comparison of USDA and interim series

	<u>Billions of dollars</u>			
	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1982</u>
Hired labor, USDA series.....	3.1	4.3	10.3	12.1
Imputed operators' labor:				
USDA series.....	6.4	5.3	5.4	4.5
Interim series.....	7.7	11.3	18.7	20.4
Income from assets:				
USDA series.....	5.4	11.0	26.1	30.5
Interim series.....	4.1	5.0	12.7	14.7

Ongoing USDA work on measures of farm employment includes expanded survey efforts that appear certain to produce improved data for use in estimating returns. The series in question are receiving serious attention from the USDA research staff, in part because they also have considerable significance in other calculations of farm income and productivity.

Readers who recall the article on returns recently published by Hottel and Gardner will note that the interim series used here copes with the problem of understated labor requirements that they noted.¹² However, it is apparent that they were not aware of the full extent to which the understated data and the computational procedure were in combination producing a progressively and dramatically increasing error, so bad that a negative value might soon be produced for operators' imputed labor! It appears that no one realized the seriousness of this problem until I happened to place the USDA hired labor and imputed operators' labor series in adjacent columns of Table 112.1, which called attention to their unrealistic divergence.

Hottel and Gardner also discussed results that would have been obtained if farm operators' labor were valued at an "opportunity cost" such as the average manufacturing wage rate, rather than the farm wage rate. This concept has other analytical uses but would be wrong in the calculation of returns to assets, for which one needs the wage at which owners of assets can hire farm labor and managers--not the wage in factory work, agricultural economics, or other jobs that farm operators could handle. In other words, when

12/ Ibid.

farm owners are hiring managers and laborers, offering them the going fees and wages, it is irrelevant that the applicants may have had other opportunities. However, if labor markets are reasonably efficient, the going fees and wages for farm work already reflect those opportunity costs that are in fact relevant.

Derivation of real capital gains

Real capital gain (loss) on farm assets is the amount by which the annual increase in total market value of assets is greater (less) than the sum of net investment and of the change in general purchasing power of the total funds tied up in these assets. Real capital gain (loss) on debt is the decrease (increase) in general purchasing power of the funds owed. Changes in general purchasing power are measured by the PCE deflator. The estimates shown in Tables 112.1 and 312.1 thus differ from those of the USDA, which uses the Consumer Price Index in these computations and has published its estimates in current dollars only.

Updated data

Beginning with the June 1984 issue, data series shown in this appendix will be updated and published in the quarterly Agricultural Finance Databook, Statistical Release E.15, Board of Governors of the Federal Reserve System. A mailing list for this periodical is maintained by Publications Services, Stop 138, Federal Reserve Board, Washington, D.C. 20551.

Table 312.1
 Real Capital Gains, PCE Basis
 1983 Dollars, PCE Deflator
 Amounts in billions of dollars

Year	Total	Assets						Debt including CCC loans
		Total	Physical assets			Financial assets		
			Total	Real estate	Machinery and vehicles			
1950...	32	32	21	-1	10	2	-2	2
1951...	22	21	15	2	3	2	-1	2
1952...	-25	-26	-3	-1	-20	-3	-1	1
1953...	-22	-23	-8	-1	-11	-2	0	1
1954...	8	8	10	0	-3	1	0	0
1955...	5	5	11	1	-3	-4	0	1
1956...	18	16	17	1	1	0	-1	2
1957...	12	10	8	0	9	-5	-1	2
1958...	33	33	21	2	9	0	0	1
1959...	1	-1	8	1	-10	0	-1	1
1960...	-4	-5	-3	-1	0	-1	-1	1
1961...	15	15	12	1	1	1	0	1
1962...	10	9	8	1	0	0	-1	1
1963...	10	9	10	0	-6	1	0	1
1964...	16	15	17	1	-4	1	0	1
1965...	25	23	24	0	8	-2	-1	2
1966...	16	13	10	0	2	2	-1	3
1967...	8	5	6	1	-2	-4	-1	5
1968...	5	0	2	0	1	-1	-1	5
1969...	-1	-6	-8	-1	5	0	-2	5
1970...	1	-4	-1	0	-3	2	-1	5
1971...	27	23	18	2	5	-2	-1	4
1972...	61	57	40	1	11	5	-1	4
1973...	98	88	72	1	7	11	-3	10
1974...	12	-1	30	10	-40	3	-3	12
1975...	71	64	61	10	7	-13	-2	7
1976...	97	91	90	4	-3	2	-2	7
1977...	49	41	42	4	4	-7	-2	8
1978...	103	90	69	2	24	-2	-3	13
1979...	64	48	42	4	6	-1	-3	16
1980...	7	-10	-3	-2	-9	7	-3	17
1981...	-77	-89	-64	3	-12	-13	-2	13
1982...	-72	-80	-78	4	-3	-2	-1	9
1983...	12	4	-3	4	-2	6	-1	8