Utilizing Expectations to Measure Economic Depreciation and Capital Gains of Farm Machinery

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Rather than relying on *ex post* market data, this study derives theoretically more appropriate measures of economic depreciation and capital gains based on the expectations of farmers. In this context, values of depreciable assets are highly sensitive to the pattern of expected future earnings and unexpected windfall gains. Experimental survey data obtained from a panel of Illinois cash grain farmers demonstrate the magnitude by which conventional accounting methods overstate economic depreciation and underestimate real capital gains. These biases make it difficult to appraise the financial well-being of the agricultural sector.

Economic depreciation is defined as the diminution of an asset's earning capacity over some period of its useful life.[1] Hence, the price of a depreciable asset at any given point of time equals the present value of benefits remaining in it, and economic depreciation for any period is the change in this present value over that period. This definition of depreciation implies several different patterns of behavior than is associated with more typical accounting measures of depreciation. For example, it is conceivable that economic depreciation may be a negative value over a period (e.g., breeding livestock in early productive career). Further, earnings attributed to the asset may change over time due to revised expectations

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of productivity and/or prices of inputs or output. The present value of these variations result in changes in asset values, namely capital gains and losses.[2,3] Of course, these shifts alter estimates of economic depreciation in subsequent periods as well.

By examining the relationships between market prices of new and used assets, agricultural economists have attempted to directly quantify economic depreciation of farm machinery.[4–6] In other sectors, changes in earnings profiles have been related to estimates of economic depreciation.[3,7]

The results of these studies are questionable because estimates of economic depreciation were obtained from *ex post* accounting data, rather than from investors' expectations of future earnings, growth in earnings, interest rates, and other financial variables at the time of investment—variables which theoretically determine asset prices.[8] Because expectations are an important determinant of asset prices, they should logically influence diminution of asset values or levels of economic depreciation over time as well.* Furthermore, previous studies have been unable to distinguish between expected and unexpected depreciation as well as expected and unexpected capital gains.† These measurement difficulties have led to the application of more straightforward rules and procedures for approximating depreciation allowances. Examples commonly used include straight line, declining balance, and sum-of-year digits methods.

This study develops a theoretically correct procedure for incorporating the effects of expectations into the measurement of economic depreciation and capital gains. The development delineates the combined effects of (a) capital gains and losses due to changes in value at a point in time versus (b) gains from changes in asset values over time.‡ The procedure is then operationalized in an experimental setting and applied to a panel of cash grain farmers in Illinois. Technique, development, empirical results, and implications of the application are discussed in following sections.

ECONOMIC DEPRECIATION AND CAPITAL GAINS

Assume an investor expects to receive a periodic stream of real rental payments $\tilde{P}$ for N periods if a depreciable asset is purchased. At the time of purchase, expectations are based on prevailing rental payments P_o because the exact level of $\tilde{P}$ in the future is uncertain. Moreover, nominal values of these payments reflect both uncertain general inflation $\tilde{i}$ and real growth in earnings $\tilde{g}$. From one period to the next, nominal earnings increase by a factor of $(1 + \tilde{i})(1 + \tilde{g})$. For simplicity, the effects of income and capital gains taxes are omitted from the analysis.

The asset is priced according to a real market rate of interest r from a financial asset. Embodied in the discount rate is a risk premium reflecting the investor's risk preferences. Following Barry and Robison,[11] the price of a depreciable asset

*Expectations have been shown to be an important factor in farmers' machinery investment[9] and land purchasing decisions.[10] In addition, accounting data bear little if any systematic relationship to the economic data that are necessary for accurate asset pricing[11] and may even lead to a double counting of resource returns.[12–14]

†The generic reference to depreciation and capital gains hereafter in this article assumes each may also be a negative value reflecting appreciation and capital losses, respectively.

‡See Barry for a further discussion of how these two forces affect asset values.[13]

$\tilde{V}_n$ with age n reflects the present value of nominal earnings remaining over its N period life:

$$\tilde{V}_n = \sum_{t=n+1}^{N} \tilde{P}\frac{(1+\tilde{\imath})^t(1+\tilde{g})^t}{(1+\tilde{\imath})^t(1+r)^t} \quad (1)$$

When the asset is new, $n = 0$. Also, expressions including the term $\tilde{\imath}$, cancel out and subsequent analyses can be performed on a real basis. If we assume:

$$\tilde{P} = P + \epsilon_p$$
$$\tilde{g} = g + \epsilon_g$$

where ϵ_p and ϵ_g are stochastic elements with expected value 0 and variance σ_p^2 and σ_g^2, respectively, the expected value of the asset at investment is:

$$E(V_n) = \sum_{t=n+1}^{N} \frac{P(1+g)^t}{(1+r)^t}$$

Economic depreciation represents the portion of an asset's earning capacity used up in a given period of production. In other words, economic depreciation $\tilde{ED}_n$ from period n to period $n+1$ equals the present value of asset earnings during that time. For any period, the asset's earning capacity is diminished by:

$$\tilde{ED}_n = \tilde{P}\frac{(1+\tilde{g})^{n+1}}{(1+r)^{n+1}} \quad (2)$$

Thus, the expected value of economic depreciation of a new asset in its first period of use equals:

$$E(\text{ED}) = P\frac{(1+g)}{(1+r)} \quad (3)$$

and the value of the asset at the beginning of the second period is expected to be:

$$E(V_1) = \sum_{t=2}^{N} P\frac{(1+g)^t}{(1+r)^t} \quad (4)$$

Expected capital gains ($\tilde{E}$CG) represent earnings growth over time and are capitalized into both the price and economic depreciation of an asset. A stochastic variable, the present value of expected capital gains at the time of investment, can be specified as the difference between the asset's value when expected capital gains are excluded:

[8]This formulation assumes productivity and hence earnings remain constant over the asset's life. Declining patterns of productivity reflecting capacity depreciation have been investigated by Penson et al. and Robison and Brake.[15,16]

$$\mathrm{ECG}_n = \tilde{V}_n - \sum_{t=n+1}^{N} \tilde{P}\,(1 + r)^t \tag{5}$$

$$= \sum_{t=n+1}^{N} \tilde{P}\,\frac{[(1 + \tilde{g})^t - 1]}{(1 + r)^t}$$

Similarly, the portion of economic depreciation stemming from expected capital gains EDECG_n between period n and $n+1$ is shown to be:

$$\mathrm{E\tilde{D}ECG}_n = \tilde{P}\,\frac{[(1 + g)^{n+1} - 1]}{(1 + r)^{n+1}} \tag{6}$$

Thus, total economic depreciation consists of two components. The first represents the reduction in the asset's ability to generate the stream of real earnings $\tilde{P}$ over time, while the second component represents the asset's reduced ability to generate capital gains or increases in real earnings over time. As time passes, depreciation arising from expected capital gains as opposed to real earning capacity becomes a larger component of total economic depreciation.

As Barry and Melichar note,[10,13] one force that changes asset values over time occurs as a result of the effects of anticipated inflation and real growth on an asset's stream of earnings. The expected growth in earnings is reflected in the asset's initial value and depreciated over the asset's life. Higher rates of earnings growth then result in increased levels of economic depreciation.

To illustrate these relationships numerically, assume an investor expects real rental payments of \$100 per period $[E(P) = 100]$, a real risk-adjusted required return of 5% ($r = .05$), a real growth in earnings of 2% $[E(g) = .02]$ and an asset life of 3 periods ($N = 3$). Table I shows expected economic depreciation and beginning asset values for each of the three periods. The investor observes P_o = \$100 and invests \$283.18 in an asset with the anticipation it will generate real

Table I. Economic Depreciation and Asset Prices, Investor Expectations Fully Realized.

Period (N)	Expected Rental Payment $[E(P)]$	Real Growth $[E(g)]$	Real Income $[P(1+g)^n]$	Asset Price[a] $[E(V_n)]$	Economic Depreciation $[E(ED_n)]$
0	100		100.00	283.18	
		2%			97.14
1	100		102.00	186.04	
		2%			94.37
2	100		104.04	91.67	
		2%			91.67
3	100		106.12	0.00	

[a]At end of period.

earnings of \$102.00, \$104.04, and \$106.12 in the next three production periods ($n = 1, 2, 3$).

Note total economic depreciation over the asset's useful life (97.14 + 94.37 + 91.67 = \$283.18) equals original purchase price. In this example, the level of expected depreciation declines over the asset's life because the discount rate exceeds the rate of real growth in earnings. If the two rates were equal, a straight-line pattern of depreciation would emerge. Thus, patterns of economic depreciation depend on the anticipated rates of earnings growth and discount factors involved.

The relationships derived above are based on *ex ante* values. However, as time passes, actual values of the variables determining asset prices and economic depreciation are revealed to the investor. Those values may or may not differ from investor expectations. If differences do occur, the price of the asset is assumed to respond instantaneously to the new information.[‖] The difference between *ex ante* and *ex post* asset prices is an unexpected capital gain (UCG_n) equivalent to:

$$UCG_n = V_n - E(V_n) \tag{7}$$

where V_n is an asset's *ex post* value calculated by eq. (1) with actual values replacing expectations.

The unexpected capital gain results in some unexpected economic depreciation (UED_n) during the period in which the gain occurs because part of the asset which generated the unexpected gain may be used up in that period. The remainder of the unexpected gain is written-off over the rest of the asset's life in subsequent periods. Because asset values in following periods respond to the gain instantaneously, depreciation of the unexpected gain becomes a component of expected depreciation.

Therefore, changes in asset values from one period to the next depend on expected economic depreciation, unexpected capital gains, and unexpected economic depreciation:

$$\bar{V}_{n+1} - \bar{V}_n = \bar{E}D_n + UCG_n + UED_n \tag{8}$$

Tables II and III continue the previous numerical example and illustrate the effects of unexpected changes in the stream of real earnings and in the rate of earnings growth, respectively. In Table II, actual earnings on which the investment decision is based are \$10 higher than expected (i.e., $E(P) = 100$ while $P = 110$ and $E = 10$), while actual growth in real earnings over the investment horizon g equal investor expectations $E(g)$. The one-time increase in real earnings results in an unexpected capital gain of \$28.32 and unexpected economic depreciation of \$9.71 in the first period. At the end of the first period, the asset's price adjusts to the new information and expected economic depreciation in remaining periods increases. Failure to recognize unexpected capital gains and unexpected economic depreciation results in a double counting of income when asset values change.[12–14]

‖Unexpected capital gains and economic depreciation (to be defined in the following paragraphs) occur every time investor expectations differ from actual parameter values. By assuming instant revision of expectations, investor errors are confined to a single period. If the investor continues to misjudge real earnings and/or growth in earnings, unexpected capital gains and economic depreciation would occur in every subsequent period of investor error.

Table II. Economic Depreciation and Asset Prices, Unexpected Increase in Real Income.

Period (n)	Expected Real Income [$E(P)$]	Actual Real Income (P)	Expected Real Growth [$E(g)$]	Actual Real Growth (g)	Expected Asset Price [$E(V_n)$]	Actual Asset Price (V_n)	Expected Economic Depreciation [$E(ED_n)$]	Unexpected Capital Gain (UCG_n)	Unexpected Economic Depreciation (UED_n)
0	100	110	2%	2%	283.18	311.50	97.14	28.32	9.71
1	100	110	2%	2%	204.64	204.64	103.80	0.00	0.00
2	100	110	2%	2%	100.83	100.83	100.84	0.00	0.00
3	100	110			0.00	0.00			

Table III. Economic Depreciation and Asset Prices, Unexpected Increase in Real Growth.

Period (n)	Expected Real Income $[E(P)]$	Actual Real Income (P)	Expected Real Growth $[E(g)]$	Actual Real Growth (g)	Expected Asset Price $[E(V_n)]$	Actual Asset Price (V_n)	Expected Economic Depreciation $[E(ED_n)]$	Unexpected Capital Gain (UCG_n)	Unexpected Economic Depreciation (UED_n)
0	100	100			283.18	294.32			
			2%	4%			97.14	11.14	1.90
1	100	100			195.27	195.27			
			2%	4%			98.10	0.00	0.00
2	100	100			97.17	97.17			
			2%	4%			97.17	0.00	0.00
3	100	100			0.00	0.00			

Table III illustrates the opposite situation whereby actual real earnings growth over the investment period ($g = 4\%$) exceed investor expectations [$E(g) = 2\%$] and the stream of real payments P equal investor expectations $E(P)$. The results are similar to those of the prior example. An unexpected capital gain of $11.14 occurs in the first period which leads to unexpected depreciation of $1.90 in the current period and higher asset values in following periods.

Hendriksen[2] notes several practical limitations of computing depreciation by the above procedures. Recent developments in experimental methods, however, facilitate the elicitation of expectations and marginal benefits of asset ownership.[17] In order to investigate the practicality of incorporating expectations into asset valuations and to illustrate the differences between economic and other more conventional approaches to depreciation accounting, an experiment involving a panel of farmers was conducted.

APPLYING THE METHODOLOGY TO A PANEL OF FARMERS

The above methodology was operationally tested in an experimental setting that was designed to elicit expectations from a panel of cash grain farmers in Illinois. During the experiment, members of the panel were asked to specify the current market value, expected economic depreciation and expected real capital gains of their machinery complements in a number of alternative decision environments. Unexpected depreciation and capital gains were computed from these data and compared with estimates derived under US Department of Agriculture (USDA) procedures.[18¶]

The following discussion describes the composition of the panel, the experimental procedure, and the methods of calculating economic depreciation and real capital gains from the survey responses.

Characteristics of Participants

To empirically estimate economic depreciation in a survey setting, seven Central Illinois cash grain farmers were asked to participate in an experiment. Data collected were part of a larger study of their investment behavior.[9]

These farm operators were selected to have differing tenure, leverage, and machinery complement age characteristics. The participants were members of the Illinois Farm Business Farm Management (FBFM) record keeping association. Records maintained by farmers of this organization contain detailed physical and financial information concerning the whole farm business (both operator and landlord shares). Although the sample drawn does not represent a random sample of all Illinois farmers, it was chosen because of the relatively high degree

¶USDA uses the perpetual inventory method to determine current replacement costs for the proportion of the total capital stock used up in a given calendar period. The procedure is similar to the double declining method of depreciation accounting. Nominal capital gains are computed as the year-to-year change in asset values less net investment (gross investment minus capital consumption). Although other depreciation methods could have been used, USDA procedures are based on current costs and explicitly value capital gains. Referral to USDA procedures is for illustrative purposes only and does not suggest that USDA should alter their accounting procedures.

of accuracy and standardization of the records maintained by participating farmers. The nearly 8,000 members of this organization constitute a diverse cross-section of Illinois agriculture. To ensure homogeneity, selected farmers (a) were members of FBFM for the past eight years; (b) were located in the central region of the state; (c) had corn, soybeans, wheat, or set-aside acres accounting for 95% of crop acreage; (d) received less than 5% of operating cash income from livestock enterprises; and (e) had farms of more than 300 acres.

Experimental Procedure

The experiment was designed to create a setting in which farmers' expectations of their own machinery complements value, depreciation, and capital gains could be elicited as their decision environment changed. The procedure consisted of four steps.[9] First, historic data from the sample farms were entered into a simulation model that individually modeled the future financial performance of the farms under alternative economic environments. In step two, each farmer reviewed financial statements generated by the model and made a machinery investment decision for the coming year. The simulation model then calculated the financial impacts of that investment decision. Farmers' subjective probability estimates for commodity prices and yields partially determined the actual performance of their firms over the course of the experiment and led to the specification of unexpected capital gains and unexpected depreciation. Interest rates, machinery, and land price expectations of the farmers were implicitly used to estimate income levels and asset values. Four contiguous decision points, representing four years into the future, constituted a base scenario.

In the third step, the experiment was repeated with alternative public policy scenarios introduced into the farmer's decision environment. These scenarios included (a) a more export market-oriented agriculture; (b) actions to reform income tax calculations; and (c) a government-sponsored interest rate buy-down program. Each scenario was designed to relate to public policy alternatives under consideration at the time of the experiment. The study's final step involved tabulation of the data collected during the experimental exercise.

Calculating Economic Depreciation and Real Capital Gains

Before each experimental production period, the participants were asked to subjectively estimate the anticipated year end value of their machinery complement $E(V_1)$ and to specify their desired level of investment (I) in depreciable assets. In addition, they were asked to estimate the current market value (V_0) of their machinery complements at the beginning of the experiment.

When asked to specify (V_0) and (V_1), farmers were instructed to consider future product prices, costs, and interest rates as well as the remaining life of their assets at each valuation point—those variables comprising eq. 2. Thus, $E(V_0)$ and $E(V_1)$ were considered to be the farmers' subjective estimates of their assets' net present value at the beginning and end of each production period. Using these data, expected economic depreciation and real capital gains (EEDCG) of each farmer's machinery complement were computed as:

$$\text{EEDCG} = E(V_0) + I - E(V_1)$$

Ideally, EEDCG would be directly elicited from farmers as two separate components—EED and ECG. However, in the pretest and in informal conversations during the experiment, participants mixed definitions of economic depreciation and depreciation used for income tax purposes. Hence, this two-step procedure was developed to estimate EEDCG as a single component. This, however, made it impossible to delineate expected economic depreciation from expected real capital gains.

At the end of each year, the actual value of machinery complements (V_1) was revealed to the participant. This value was predetermined in part by the participant's expectations and by random adjustment factors which were designed to create uncertainty in their decision environment. Unexpected economic depreciation and real capital gains (UEDCG) reflected unexpected changes in the market value of assets:

$$UEDCG = V_1 - E(V_1)$$

Again, unexpected economic depreciation and unexpected capital gains could not be estimated independently.

RESULTS

The aggregate responses of the seven participants as to the value of their machinery complements and intended investments are presented in Table IV. All values were elicited from the farmers in nominal dollars. To facilitate intertemporal comparisons these values were deflated by the implicit price deflator for the gross national product. No attempt was made to expand the data to a regional or state-level estimate.

The upper portion of the table shows the participants' subjective estimates of their machinery complement's year end value, the actual December 31 value of their machinery complement, gross investment, expected economic depreciation– capital gains (EEDCG), and unexpected economic depreciation– capital gains (UEDCG) for each year of the base scenario. For illustrative purposes, the bottom portion of the table shows the depreciation, December 31 book value, and capital gains of their machinery complements when computed by current USDA procedures.

The combined initial market value of the seven participants' machinery complements prior to the experiment was $739,400.# In 1987, they planned to spend $74,200 on new machinery. Given this level of investment, anticipated market developments, and the initial value of their complements, they expected their machinery to be worth $788,961 at the end of the year. By design, the actual value of their machinery complements coincided exactly with their expectations during the first year of the base scenario.

From these data, expected economic depreciation and capital gains of their machinery were computed. EEDCG was defined earlier to be the sum of gross investment and the expected change in machinery value during the year (actual value of the machinery complements at the beginning of the year less the expected value of the complements at the end of the year). In 1987, EEDCG was

#Alternatively, these results could have been averaged and presented on an individual farmer basis. Presentation in aggregate form more closely aligns with USDA procedures.

Table IV. Comparison of Alternative Methodologies for Estimating Depreciation, Capital Gains, and Asset Value—Base Scenario.[c]

Values	Initial	1987	1988	1989	1990
Computed by Survey Methodology					
Expected Dec. 31 Value		788,961	899,401	956,604	1,038,842
Actual Dec. 31 Value	739,400	788,961	931,068	945,128	1,046,599
Gross Investment		74,200	88,998	15,001	72,002
EEDCG[a]		24,639	−21,442	−10,535	−21,712
UEDCG[b]		0	31,667	−11,476	7,757
Computed by USDA Procedures					
Actual Dec. 31 Value		725,238	730,043	667,582	665,222
Depreciation		112,023	111,600	107,455	102,501
Capital Gain		23,661	27,407	29,992	28,140

[a]Expected economic depreciation and capital gains.
[b]Unexpected economic depreciation and capital gains.
[c]Values in 1986 dollars.

computed to be $24,639 ($74,200 + 739,400 − 788,961). Since the actual December 31 value of their machinery complements equaled their expectations, there were no unexpected economic depreciation or capital gains (i.e., UEDCG = 0).

The participants indicated informally that they expected the farm crisis of the early 1980s to end by 1988. Consequently, during the experiment they purchased $88,998 of new machinery and expected their machinery to rise in value and be worth $899,401 at the end of the 1988. This optimism translated into a net $21,442 appreciation of their machinery complement for 1988. However, in addition to this general optimism, higher than expected commodity prices and yields prevailed during the second year of the simulation exercise. Thus, the year-end value of their machinery increased even more than expected. This difference of $31,667 is defined to be unexpected economic depreciation and real capital gains ($931,068 − $899,401).

In the latter two years of the base scenario, net incomes were less than and greater than expected, respectively. Therefore, UEDCG was negative in 1989 and positive in 1990. During both years, the participants' machinery complements appreciated in value.

By December 31, 1990, the aggregate market value of their machinery had risen to $1,046,599 from an initial value of $739,400 in 1986—a 42% increase. Most of this increase occurred because of $250,201 purchases during the four years of the base scenario. Unexpected economic depreciation and capital gains totaled only $27,948 over the four-year period. The remainder of the increase was due to expected appreciation of owned assets because participants felt the value of their existing capital was going to be higher after 1986 than in years prior (i.e., EEDCG was $−29,050).

The aggregate data of the seven farmers masks variation among participants in investment levels and depreciation expectations. For instance, in 1987 gross investment per farm ranged from $0 to $66,000. Participants with higher levels of land ownership and those with older machinery complements had significantly different investment levels. Expansion of this experimental procedure would permit even more interesting cross tabulations among farmers with differing socioeconomic characteristics.

Depreciation, asset values, and capital gains as calculated by current USDA procedures are shown in the bottom of Table IV. USDA's rate of depreciation for other machinery (14%) was used for illustrative purposes. Because the participants purchased all types of machinery, it was felt this rate was most representative.

When compared to EEDCG estimates calculated above, depreciation derived by conventional accounting procedures is $462,629 greater over the four-year period. Because December 31 asset values equal the remaining, undepreciated portion of the capital stock, the ending value of the farmers' assets are understated by $381,377. Capital gains are $81,252 higher than UEDCG computed above.

Therefore, a distorted perspective of the participants' financial well-being can be discerned by applying conventional accounting methods. In this example, those methods portray a significantly higher depreciation rate (implying a lower level of income) and declining asset values over the simulation period when in fact the ending value of assets actually increased.

Similar biases occur when the expectations and financial well-being of participants deteriorate (Table V). In scenario 1, commodity prices are assumed to decline to export-market clearing levels. Under such a policy, participants believed the largest drop in prices and adjustment in asset values would occur in 1988. Gross investment in the second year of scenario 1 was only $9,002. Under both procedures, the ending value of assets is lower than those of the base scenario. Further, because the discounted value of future production originating from the capital stock is reduced, unexpected capital losses are realized by the farmers. Conventional accounting procedures, however, yield real capital gains because accounting depreciation still exceeds the actual decline in asset values in the example.

The three alternative scenarios in Table V illustrate the interrelationships between participant expectations and resulting impacts on depreciation and valuation of the farmers' capital stock. These expectations vary over time and/or across farmers. Use of conventional methods of valuing farmers' capital stocks makes it difficult to truly assess producer financial well-being.

CONCLUSION

This study used experimental methods to compare conceptual and conventional approaches of measuring economic depreciation. The conceptual approach utilized farmer's expectations to distinguish between expected and unexpected values of depreciation and of capital gains. These expectations were elicited from a panel of Illinois farmers in an experimental setting.

Substantial differences occurred when economic values of depreciation, assets, and real capital gains were compared with similar values derived by conventional accounting methods. The direction of bias depended on environmental conditions facing farm operators. In general, conventional accounting procedures overestimated depreciation and underestimated the value of each participant's

Table V. Comparison of Alternative Methodologies for Estimating Depreciation, Capital Gains, and Asset Values under Optional Public Policy Scenarios.[c]

Values	Initial	1987	1988	1989	1990
Scenario 1—Export-Market-Oriented Farm Legislation					
Computed by Survey Methodology					
Expected Dec. 31 Value		775,361	750,856	835,056	957,456
Actual Dec. 31 Value	739,400	754,964	707,409	882,402	898,737
Gross Investment		79,198	9,002	115,003	54,999
EEDCG[a]		43,237	13,110	−12,644	−20,055
UEDCG[b]		−20,397	−43,447	47,346	−58,719
Computed by USDA Procedures					
Actual Dec. 31 Value		729,886	659,795	697,688	676,460
Depreciation		112,372	106,676	104,216	105,637
Capital Gain		23,661	27,583	27,106	29,409
Scenario 2—Tax Reform					
Computed by Survey Methodology					
Expected Dec. 31 Value		793,961	832,401	1,037,268	1,148,760
Actual Dec. 31 Value	739,400	793,961	873,549	1,037,268	1,037,834
Gross Investment		79,198	29,001	80,997	75,782
EEDCG		−24,637	−9,439	−19,048	−35,710
UEDCG		0	41,148	63,674	−110,926
Computed by USDA Procedures					
Actual Dec. 31 Value		729,886	678,395	682,715	682,346
Depreciation		112,372	108,076	104,547	104,929
Capital Gain		23,661	27,583	27,871	28,778
Scenario 3—Interest Rate Buydown					
Computed by Survey Methodology					
Expected Dec. 31 Value		856,961	944,046	967,433	1,063,837
Actual Dec. 31 Value	739,400	841,511	897,221	1,008,445	1,010,665
Gross Investment		142,198	94,977	70,000	46,998
EEDCG		24,637	−7,558	−212	−8,394
UEDCG		−15,450	−46,825	41,012	−53,172
Computed by USDA Procedures					
Actual Dec. 31 Value		788,476	792,044	774,242	737,590
Depreciation		116,782	121,207	120,342	116,286
Capital Gain		23,661	29,797	32,540	32,636

[a]Expected economic depreciation and capital gains.
[b]Unexpected economic depreciation and capital gains.
[c]Values are in 1986 dollars.

machinery complement during the four simulation years. The existence of such biases makes it difficult to appraise the financial well-being of the agricultural sector using conventional accounting methods. Such conventional methods of specifying economic depreciation would more closely align with conceptual approaches only if expectations could be practically incorporated. Thus, additional research leading to greater refinement in the empirical specification of economic depreciation appears warranted.

There are a number of limitations of this study. First, the results of this study were based on the responses of only seven farmers—responses that were highly variable. At most, the findings imply a need for further testing to determine if similar biases exist in other geographic locations, farm types, and at more aggregate (i.e., state, regional, and national) levels. Second, the conceptual approach to measuring depreciation yielded estimates that varied dramatically year-by-year as farmer expectations changed. This variation does not exist in financial indicators derived by conventional accounting procedures as depreciation rates and other parameters remain fixed for a given analysis. This additional variation may dismay external users of economic statistics even though providing conceptually more correct indicators of well-being to the farm operator. Further investigation of the most appropriate depreciation method, given the interest of differing uses of these data, would be of interest.

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