MACHINERY REPLACEMENT, MULTIPLE OPTIMA, AND THE 1986 TAX REFORM ACT

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Abstract

The 1986 Tax Reform Act established a first year $10,000 expensing option and, for most farm equipment, a 7-year depreciation schedule. Under a profit maximization criterion, these tax law features can lead to multiple optima dependent upon discount and marginal tax rates. For example, the economically efficient time to reinvest under a 2 percent after-tax discount rate is at 4, 8, and 30 years for the grower in a 33 percent tax bracket. Thus, the profit maximization behavioral rule needs to be supplemented with knowledge about a farmer's objectives in order to select the "correct" optimal reinvestment interval.

Key words: machinery reinvestment, taxes, farmer behavior.

The 1986 Tax Reform Act changed many aspects of U.S. tax law. Farmers can no longer take an investment tax credit (Durst), and depreciation was changed in several ways. A new 7-year class was added, which includes almost all farm machinery. A 5-year class includes autos, pickups, and computers, as well as breeding and dairy cows. Horses and hog breeding stock are in a 3-year class. Farm buildings are now depreciated over 31.5 years, as compared to 19 years under the old law. Depreciation is also affected by the purchase year expensing option of $10,000 if total investment does not exceed $200,000 (Dunaway). The double-declining balance depreciation method can be used for the 3-, 5-, and 7-year asset classes (Dunaway).

Other major changes affecting machinery reinvestment were in the marginal tax rates. In 1988 and years following, there will be two basic rates for joint returns: (1) 15 percent up to $29,750, and (2) 28 percent over $29,750 (Durst). However, the personal exemption will be phased out for the higher income earners, making an additional, effective marginal tax bracket of 33 percent for incomes over $71,900 (Durst). It is expected that 75 to 80 percent of the farmers in the U.S. will be in the 15 percent bracket (Durst).

The fact that farmers can expense $10,000 in the purchase year and that there can be rapid depreciation in the early years suggests there may be multiple optimal machinery replacement times, in contrast to what is demonstrated by the standard models of farmer behavior. That is, the conveniently smooth and continuous marginal and average return functions of the standard replacement models probably do not exist due to the tax laws. Yet it is not clear how such "lumpiness" and "discreteness" might affect the decision to reinvest.

If there were multiple optima caused by tax rules, the very basis for decision making may have to change. If profit maximizing rules gave more than one answer, then the grower could no longer just use the profit maximizing rule to decide when to reinvest in equipment. Another criterion, or a set of criteria, would be needed to supplement the profit maximization objective.

The purpose of this paper is to explore the effects of the 1986 tax rules and the phenomenon of multiple optima in machinery replacement decision theory.

LITERATURE

Researchers have previously examined the

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impact of taxes on profit maximizing behavior using simulation models. Chisholm explored the effects of the time pattern of depreciation and various investment incentives in Australia. The simulations showed that removing a 20 percent investment allowance, which had given a deduction from taxable income in the year of purchase, and introducing a longer depreciation period increased the optimal reinvestment time for high tax bracket farms. However, there was not any effect on the time to reinvest for those farms with marginal tax rates up to and including 25 percent, except under a zero discount rate. Particular methods of depreciation were not found to have any substantial impact on the optimal period; however, the length of the depreciation period was a crucial variable.

Chisholm's simulation indicated the optimal replacement time for U.S. farm machinery (tractors and main harvest equipment) to be around 11 years. Kay and Rister argued that this result did not coincide with actual U.S. grower behavior since many growers trade machinery prior to 11 years. Using a simulator, it was found that 1) the after tax discount rate had the greatest impact on the reinvestment period; 2) the tax rate had little effect on the optimal replacement policy; 3) the depreciation method made little difference; and 4) the models tended to predict replacement ages longer than normally observed for the typical commercial U.S. grower.

Kay and Rister's simulations also illustrated that an additional first year depreciation and investment tax credit reduced the optimal replacement age. The pattern of repair costs and the probability of machinery breakdown were argued to be key forces affecting the replacement interval.

Reid and Bradford examined the impacts of using alternative salvage functions. As in other studies, a single optimum was found which generally showed replacement periods in the range of 5 to 10 years. Similarly, more advantageous tax laws reduced the optimal reinvestment period, especially for those growers with higher tax rates and lower discount rates.

Several hypothesis were suggested from the past results and the character of the 1986 Tax Reform Act. Generally, tax laws were expected to affect the (idealized) behavior of profit maximizing farmers, especially those having both lower discount rates and higher income, as suggested by the Reid and Bradford results. Lower discount rates shorten the optimal reinvestment period because the opportunity costs of retaining the equipment for longer periods increase as the rates decrease. Higher tax brackets have the same effect on the optimal reinvestment interval because of the money saved on taxes, which effectively lowers the outlay for machinery.

Additionally, the 1986 Tax Reform Act could lead to multiple optima under a profit maximizing criterion. This hypothesis follows because of the discontinuities introduced by the expensing and depreciation options. Expensing in the first year should tend to cause earlier reinvestment because of the immediate impact on a farmer's income. This notion is supported by the findings of both Chisholm and of Kay and Rister which showed that removing tax benefits in the early periods increased the optimal reinvestment time. Thus, it could also be expected that more rapid depreciation in the early years could cause an early optimal replacement time.

The departure of this study from previous research is the hypothesis of multiple optima. A simulation model was developed to explore these relationships, especially focused on the impact of early tax benefits and discreteness in the tax law.

THEORETICAL AND EMPIRICAL MODELS

A continuous time model, assuming a long-term planning horizon and a chain of reinvestments in machines is given by (Henderson and Quandt; Perrin)[1]

$$(1)\ PV = \frac{\int_0^T \pi(t)e^{-rt}\,dt - I_o + S(T)\,e^{-rT}}{1 - e^{-rT}},$$

where

PV = net present value of the profit stream through an infinite number of reinvestment periods;

$\pi(t)$ = profit in time t;

[1]The machinery replacement issue is often phrased in terms of a minimum cost problem, because of the difficulty of separating returns among machines. The profit maximizing behavioral assumption was maintained here. While the separability problem is acknowledged, the concern is with overall grower behavior across the entire operation, rather than the particular decision to replace a tractor or some other machine. However, the same general conclusions derived herein will also apply to that specific decision.

e^{-rt} = discounting weight, with r the after tax discount rate;

I_o = initial investment;

S(T) = salvage value at T; and

T = optimal time interval for replacement.

Differentiating equation (1) with respect to the optimal time to replace machinery, T, gives

$$(2)\quad \pi(T) + S'(T) = \frac{r}{1 - e^{-rt}} \left[\int_o^T \pi(t)\, e^{-rt}\, dt - I_o + S(T) \right].$$

Converting equation (2) to discrete terms in order to consider year-to-year investment problems and the discontinuities inherent in tax rules gives

$$(3)\quad \pi_T + (dS_t/dt)_t = \frac{r}{1 - (1-r)^T} \left[\sum_{t=o}^{T} \pi_t \left(\frac{1}{(1-r)^t} \right) - I_o + S_T \right],$$

where

π_t = $(1-G_t)(V_t - C_t - R_t) + G_t E_t + G_t D_t$ or the net after tax income/acre, and π_T is for the optimal replacement interval T;

$(dS_t/dt)_t$ = derivative of the salvage value function S_t evaluated at time t;

S_t = salvage value at the optimal replacement time T;

G_t = marginal tax rate (e.g., 0.15 for 15 percent);

V_t = revenue/acre;

C_t = all costs/acre other than repair and maintenance;

R_t = repair cost/acre;

D_t = depreciation/acre; and

E_t = expensing/acre.

The left hand side of equation (3) is the marginal return from the use of existing machinery for another year, and the right hand side is the average return per year from the machinery. So, as usual, the optimal T is defined by equating marginal to average returns, thus maximizing the average return for the long-term planning horizon.

Returns, Costs, and Investment

Sugarcane is a perennial, with each crop after the first year of plant cane called a ratoon. Growers in the study area typically harvest a plant and two ratoon crops before the fields are fallowed.[2] Typical costs and returns are illustrated in Table 1; for a detailed discussion of how the costs and returns were developed, see Lynne and Dunn.

There are also costs associated with the fallow, mainly for water control to reduce subsidence in these organic soils. This fact, plus the focus of this paper on tax impacts on total farm income and investment, led to using cost and return estimates for the entire 640 acre unit, as opposed to only returns on the harvested acreage.

The variable cost estimates of $473 per acre[3] excludes repair costs. Repair costs were isolated because of their expected impact on the optimal machinery reinvestment interval. The typical set of machinery for such a tract is also listed in Table 1, leading to an average investment of $242 per acre. The values from Table 1 used in the simulation of equation (3) were revenue (V_t) = $864, costs ($C_t$) = $613, and initial investment (I_o) = $242.

Returns were discounted in order to reflect the time value of money. Lacking knowledge of actual rates for sugarcane farmers, a range of 2 to 6 percent in the after-tax, inflation-free rate was selected. This yields a before-tax rate of 3 to 9 percent, which was believed to give an adequate range to represent most farmers. A range was selected in order to determine how sensitive the results might be to various discount rates.

Repair and Salvage Costs

The repair costs in time t, R_t, were calculated from the difference in accumulated

[2]The production period is four years—plant cane, ratoon one, ratoon two, and a year in fallow. "Ratoon" is the name attached to the cane when re-growth is harvested.

[3]The per acre estimates were used simply to reduce the size of numbers in the calculations.

TABLE 1. RETURNS, COSTS, AND MACHINERY REQUIREMENTS FOR SUGARCANE IN THE EVERGLADES AGRICULTURAL AREA OF SOUTH FLORIDA, 1985[a]

	Item		Acres	Total Dollars	Dollars Per Acre
Returns					
	Plant cane		161	204,360	1,269
	1st ratoon		161	173,000	1,075
	2nd ratoon		161	137,218	852
	Fallow		157	—	—
	Molasses payment		640	38,384	60
		Total	640	552,963	864
Costs	Variable[b]		640	302,861	473
	Fixed[c]		640	89,229	139
		Total	640	392,090	613
Investment			640	154,860	242

Equipment: Tractors, 110-115 hp and 60 hp; 12′, 24″ offset disk; 21′, 21″ disk harrow; 8′, 24″ disk; 12′, 20″ chisel plow; 8-row, 30″ land leveler; 2-row mole drain; 3-row furrow plow; 10′ covering rig; 3-row scratcher; rolling cultivator; 7′ rotary mower; 92hp, 36″ pipe, pump.

[a]Derived from Alvarez and Rohrmann (see Lynne and Dunn).

[b]Includes costs for land preparation, planting, cultivation, irrigation, harvest, and interest. Repair costs are not included.

[c]Includes a land charge, taxes on land and drainage, and insurance.

repair costs in time t, R_{at}, less those in the previous time period, R_{at-1}, or

$$R_t = R_{at} - R_{at-1} .$$

The accumulated repair costs R_{at} were calculated from

$$R_{at} = (I_o)(A_t) ,$$

where A_t is the accumulated repair cost function, a proportion, in time t.

The A_t was developed using the estimates of machinery use for the typical 640 acre farm and estimates of the repair cost factors from Hunt. For example, the accumulated repair factor for a disk harrow[4] from Hunt was

$$A_{it} = -0.0007H_{it} + 0.0028H_{it}^2 - 0.00018H_{it}^3 ,$$

where the "i" in the subscript refers to the ith machine, in this case the disk harrow, and H_{it} is the thousands of acres covered in year t with the machine. Alvarez and Rohrmann provided estimates of the number of acres that could be covered by each machine each day as well as the number of times each operation was performed during a year. These data facilitated estimating the total use, H_{it}. Values of A_{it} were calculated for each machine. An overall A_t factor was achieved by first weighting each of the A_{it} estimates by the percentage that the machine represented of the whole farm investment, or

$$A_{it} * \frac{I_i}{I_o} ,$$

where I_i is the investment in the ith machine. This gave an estimate of the accumulated repair costs A_t in each year, which was then fit with regression procedures[5] as a function of

[4]Hunt provided repair functions for a variety of machines, including cultivators, disks, plows, rotary hoes, planters, combines, stalk choppers, corn pickers, and tractors. Consultation was necessary with experts familiar with the machines used in both the midwestern U.S., on which Hunt's data were based, and the sugar cane area in order to select appropriate functions. This was accomplished by consultation with Dr. Jose Alvarez, a University of Florida economist stationed at the Everglades Research and Education Center, and an agricultural engineer who was willing to help make some judgments about which repair function most closely described the sugarcane machinery (see footnote 6).

[5]The ordinary least squares algorithm was used as a curve fitting procedure. Only the R^2, indicating the prediction capacity of the equation, becomes important.

time, giving the function

$$A_t = (0.0053_t^{1.6736}).$$

The R^2 was 0.98. In the tenth year, repair costs were four percent which was expected to be realistic for most farms.[6]

The salvage value S_t was also fit with regression procedures to data provided by Hunt (p. 63), giving

$$S_t = I_o (e^{-0.1117t}).$$

The R^2 was 0.97. The function predicts salvage declining exponentially to 33 percent of the original price in the tenth year, which is consistent with Hunt's estimate.

Expensing, E_t, was calculated as

$$E_t = \begin{array}{ll} \$10{,}000/640 & \text{for } t = 1 \\ 0 & \text{for } t > 1 \end{array},$$

reflecting the fact the farm is restricted to taking the entire $10,000 in the first year. Depreciation was calculated as

$$D_t = (d_t)(I_o - E_1),$$

using the double-declining balance technique, but with a switch to the straight-line method in the last 3.5 years, to maximize depreciation (Dunaway). The half-year convention was applied for the first year, which gives the remaining deduction in the eighth year, or a schedule of $d_1 = .143$, $d_2 = .245$, $d_3 = .175$, $d_4 = .125$, $d_5 = .089$, $d_6 = .089$, $d_7 = .089$, $d_8 = .045$, and $d_t = 0$ for $t > 9$.

Sample Calculation of Net After Tax Income, π_t

Using the estimates from Table 1 and the repair cost function, typical calculations for a 33 percent marginal tax rate are

$$\pi_1 = (1-0.33)(\$864-612.64-1.28) + (0.33)(0.143)(\$241.97-(\$10{,}000/640)) + (0.33)(\$10{,}000/640),$$

$$\pi_2 = (1-0.33)(\$864 - 612.64-2.78) + (0.33)(0.245)(\$241.97 - (\$10{,}000/640)),$$

$$\vdots$$

$$\pi_9 = (1-0.33)(\$864-612.64-9.70).$$

Notice in the first year the expensing option gives ($10,000/640) = $15.63 per acre as a direct deduction, so it increases after tax income. Of course, the expensing reduces the basis for depreciation to ($241.97−$15.63 = $226.34). In the second through the eighth year, the influence of the tax law is shown only by the depreciation allowance. Repair costs increase each year, from $1.28 in $t = 1$, to $2.78 in $t = 2$, and to $9.70 per acre in $t = 9$. The calculation of net after-tax income in the ninth year and beyond includes only the impact of the increasing repair costs and no tax advantages.

The strategy was simply to calculate the left and right hand sides of equation (3) using a spreadsheet microcomputer program and determine where they were equal. In cases where equality occurred between years, the year with the smallest difference between the marginal and average returns was used.

RESULTS

The simulation showed only one optimum late (L) in the machine life (> 10 years) for the low marginal tax rate cases. However, with low discount rates and high marginal tax rates, optimum reinvestment times occurred in the early (E) (< 5 years), middle (M, 6 to 10 years), and again late (L) in the machine's life. The details supporting these outcomes follow.

The results for all the simulated cases are presented in Table 2, with supporting data in Appendix Table 1.[7] To interpret Table 2 note, first, an "N" indicates there was no optimal T in that period of the machine's life. A number in the table is the optimal T in the associated period E, M, or L. Second, the designation of N or an optimal T in parentheses refers to the result without expensing. Thus, the results for the no tax law case are given by designations in parentheses within the first row of Table 2.

The repair and salvage cost effects represented in the no tax law case suggested replacement only in the L period, with an optimal T from 31 to 43 years. There were no optima in the E and M periods. These results serve as the basis for isolating the impact of the tax law.

The effect of the tax law first starts to show at the 28 percent marginal tax rate, where

[6]Based on personal communication with Dr. W. D. Shoup, Agricultural Engineering Department, University of Florida.

TABLE 2. OPTIMAL MACHINERY REPLACEMENT INTERVAL T AS AFFECTED BY MARGINAL TAX AND AFTER TAX DISCOUNT RATES, SUGARCANE IN THE EVERGLADES AGRICULTURAL AREA OF SOUTH FLORIDA, 1985

Marginal Tax Rate	After Tax Discount Rate								
	2 percent			4 percent			6 percent		
	E[a]	M	L	E	M	L	E	M	L
Percentage	years								
0	N(N)[b]	N(N)	31(31)	N(N)	N(N)	37(37)	N(N)	N(N)	43(43)
15	N(N)	N(N)	31(31)	N(N)	N(N)	37(37)	N(N)	N(N)	44(44)
28	5(N)	8(8)	30(30)	N(N)	N(N)	38(38)	N(N)	N(N)	46(46)
33	4(5)	8(8)	30(30)	N(N)	8(9)	38(38)	N(N)	N(N)	46(46)

[a]E, M, and L refer, respectively, to the early (< 5 years), middle (6 to 10 years), and late (> 10 years) periods in the life of the machinery.

[b]The N designation indicates there is no optimal time to replace the machinery in this period of the machine's life for the given particular discount and tax rate pairing.

[c]The designations in parentheses show the results when there is no expensing option. Thus, the "no tax" bill situation is depicted by the marginal tax rate = 0 and the numbers in parentheses in the first row.

multiple optima occur at 5, 8, and 30 years under the two percent discount rate, called the (28, 2) case. Similar changes occur for the (33, 2) case (Table 2). The E period optima are caused by the expensing option and the rapid depreciation allowed during the E period; the M period optima are caused by depreciation running out in the eighth year. By the L period, there is little impact from the tax laws.

Expensing in the first year tends to shift the optimal replacement interval forward. This phenomenon is clearly demonstrated for the (28, 2) case, where there is no E period optimum with expensing (notice the "N" in parentheses), while with expensing there is an optimum at five years. Expensing also caused a reduction in the E period optimum from 5 to 4 years and the M period optimum from 9 to 8 years for cases (33, 2) and (33, 4), respectively.

The multiple optima phenomenon is clearly demonstrated in Figure 1 for the (33,2) case (data are shown in Appendix Table 2). As also shown in Table 2, profits were maximized at 4 years, 8 years, and again at 30 years. To summarize: the first discrete jump and optimum was caused by the expensing option and the rapid depreciation allowed in the E period; the second optimum was caused by the depreciation running out in the eighth year; and the third optimum in L occurred because of rising repair costs and declining salvage.

Other general tendencies were as expected. Those farmers with lower discount rates could be expected to reinvest more frequently. This finding is due to the costs of holding an asset longer, which are now higher in an opportunity cost sense because of the lower discount rate. Also, there is an important complementarity between discount and marginal tax rates. High income with low discount rates resulted in more sensitivity to the tax law.

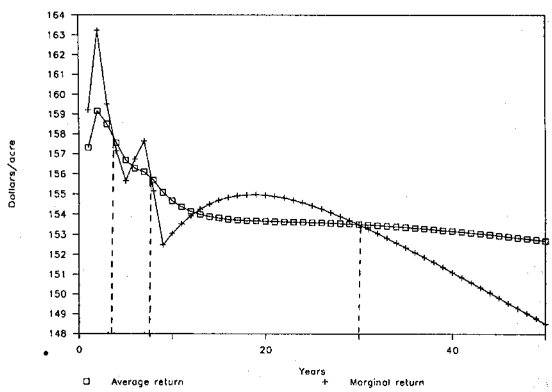

Figure 1. Marginal and Average Return Relationships for the 33 Percent Marginal Tax Rate and 2 Percent After-tax Discount Rate, Case (33,2), Sugarcane in the Everglades Agricultural Area of South Florida, 1985.

[7] The estimates in Appendix Table 1 are the marginal less the average return (the left-hand side of equation (3) minus the right-hand side) for the "with tax" cases. The data for the no expensing and no tax cases are not presented because of space limitations. These are available upon request. Notice also that the optimal T is selected in each period where the marginal return minus the average return switches from positive to negative, which insures second order conditions are met.

SENSITIVITY ANALYSIS

Because multiple optima have not been demonstrated in previous research, a sensitivity analysis was performed on the major elements of equation (1), including the level of the costs and returns, the repair and salvage functions, and the level of investment.

The results were robust with respect to costs and returns different from those in Table 1 for any given tax bracket. A change in the before-tax returns or the annual total costs did not affect the results. However, rising revenues or declining costs could put the farmer into a higher tax bracket, with the results illustrated in Table 2.

The multiple optima were also robust to alternative repair functions. All repair functions up to the one giving four percent in the year 10 gave essentially the same results as in Table 2. Interestingly, more rapidly rising repair cost functions in general reinforce the multiple optima phenomenon. While not generally realistic, a function rising to a 10 percent repair cost in the tenth year caused the marginal and average return functions to be almost identical in value during the entire 3 to 7 year period.

Higher salvage values in each year also reinforce the multiple optima result and reduce the optimal intervals. For example, the simulation for a 38 percent salvage in year 10 (five percent higher than the base case) moved the optima to 3, 7, and 26 years for the (33, 2) case. Lower salvage value had the opposite effect with optimal intervals increasing. For example, with a 27 percent salvage by the tenth year, the optima for the (33, 2) case were at 9 and 32 years, with the E period no longer relevant. These directions of change are to be expected because a higher salvage value increases the opportunity cost of holding machinery.

The general effect from increasing I_O is to increase the optimal reinvestment interval. Although this effect was not large enough to change case (33, 2) with even a three-fold increase in I_O, the same three-fold increase did remove the E period optimum for the (28, 2) case. The M period optima were not changed for any of the cases. These results could be expected due in part to smaller investments being impacted relatively more by the expensing option.

SUMMARY AND CONCLUSIONS

The general tendencies in the simulations are the same as have been found in previous studies. Removing early period expensing lengthens the optimal interval, consistent with findings of Chisholm, and Kay and Rister, where these researchers removed early period investment allowances. All previous studies have also shown a reduction in optimal intervals for lower discount and higher marginal tax rates. In addition, more advantageous tax laws reduce the optimal reinvestment interval, especially for those farmers with low discount rates and higher incomes, which was also found by Reid and Bradford.

In fact, the results suggest that low income farmers will ignore the tax law, which was also found by Chisholm. Profit maximizing reinvestment for these farmers occurs only late in the life of the machinery. This is significant because Durst suggested that 75 to 80 percent of U.S. farmers are in the low income, 15 percent bracket. However, the simulation results showing the longer replacement intervals need to be interpreted with caution, as the 30 to 46 year predictions are simply not realistic. A reason for these 30 year and greater predictions is that accurate repair cost estimates beyond about 10 years are not available. The repair costs in the simulator apparently are not increasing rapidly enough after the tenth year. It may also be that these optimal replacement models always predict longer times than those observable for actual growers, as was suggested by Kay and Rister.

The important difference in these results is that the hypothesis of multiple optima is supported for the higher income farmers, especially for those also having low discount rates. These high income farmers will face difficult reinvestment decisions. Because of multiple optima, other factors besides profit maximization, which are not easily captured in the standard machinery replacement model, will normally have to be introduced in order to aid the decision process. Such matters as machine reliability will affect the time to reinvest; another aspect is that a multiple objective function likely influences each farmer's behavior. Because of these other considerations, a high income farmer may have some machinery only 4 to 5 years old, other pieces being traded when depreciation allowances have been used at 8 to 9 years, and still other equipment being much older, with all of these choices economically optimal.

These different ages could occur because the "other considerations" may be different for alternative machines. For example, a farmer may trade tractors and harvest equipment every 4 to 5 years because of the reliability factor or because he/she enjoys the latest technology for these kinds of machines. A new tractor may be more visible to neighbors and important others, which could also serve to satisfy objectives other than economic efficiency.

That there are a multiplicity of human values that motivate human behavior is now widely accepted in the social sciences, especially social psychology (e.g., see Rokeach). There are purposes other than achieving a "comfortable life" (Rokeach), which is the main objective represented in the profit maximization model. These other objectives need to be better understood. This knowledge is especially crucial if the profit maximizing criterion does not lead to a unique solution, which was demonstrated here.

Because the 1986 Tax Reform Act has just been installed, it is an opportune time to test the notions of this paper. The focus should be on whether the multiple optima are in fact descriptive of grower behavior, and, if so, how and why growers choose one interval over another. Knowledge about what motivates machinery reinvestment will be fundamental in designing future legislation and in helping growers make decisions.

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Appendix Table 1. Marginal Return Less Average Return in the First 10 Years of Machinery Life, Sugarcane in the Everglades Agricultural Area of South Florida, 1985

Year	Cases[a]								
	(15,2)	(15,4)	(15,6)	(28,2)	(28,4)	(18,6)	(33,2)	(33,4)	(33,6)
	dollars/acre								
1	1.90	2.42	2.93	1.95	2.42	2.93	1.90	2.42	2.92
2	3.24	3.98	4.72	3.83	4.57	5.32	4.06	4.80	5.55
3	2.24	3.15	4.08	1.35	2.26	3.18	1.00	1.91	2.83
4	1.92	2.98	4.08	0.23	1.28	2.35	−0.42	0.62	1.69
5	1.91	3.11	4.35	−0.22	0.95	2.16	−1.04	0.12	1.31
6	2.79	4.12	5.50	1.10	2.38	3.72	0.45	1.71	3.03
7	3.45	4.90	6.40	2.07	3.47	4.92	1.54	2.92	4.35
8	2.61	4.16	5.77	0.35	1.82	3.37	−0.53	0.92	2.44
9	1.74	3.35	5.06	[B]1.40	0.12	1.74	−2.61	−1.12	0.46
10	2.22	3.90	5.69	−0.55	1.02	2.71	−1.61	−0.08	1.56

[a]A 15 percent marginal tax rate and 2 percent after-tax discount rate are illustrated by case (15,2), for example.

Appendix Table 2. Marginal and Average Return Data for Sugarcane in the Everglades Agricultural Area of South Florida, 1985[a]

Year	Marginal Return	Average Return	Year	Marginal Return	Average Return
	Dollars/Acre			Dollars/Acre	
1	159.22	157.32	26	154.27	153.59
2	163.22	159.16	27	154.10	153.57
3	159.50	158.50	28	153.91	153.55
4	157.14	157.56	29	153.71	153.53
5	155.66	156.70	30	153.50	153.51
6	156.73	156.28	31	153.28	153.49
7	157.65	156.11	32	153.06	153.46
8	155.16	155.69	33	152.83	153.43
9	152.48	155.09	34	152.59	153.40
10	153.06	154.67	35	152.35	153.37
11	153.54	154.37	36	152.11	153.33
12	153.93	154.16	37	151.86	153.30
13	154.25	154.07	38	151.61	153.26
14	154.51	153.90	39	151.36	153.22
15	154.70	153.82	40	151.10	153.18
16	154.83	153.76	41	150.85	153.13
17	153.92	153.72	42	150.59	153.09
18	153.97	153.70	43	150.33	153.04
19	154.98	153.68	44	150.07	152.99
20	154.95	153.66	45	149.82	152.95
21	154.90	153.65	46	149.56	152.90
22	154.81	153.64	47	149.30	152.85
23	154.71	153.63	48	149.04	152.80
24	154.58	153.61	49	148.98	152.75
25	154.43	153.60	50	148.52	152.69

[a]Data based on a 33 percent marginal tax rate and a 2 percent after-tax discount rate.