A FURTHER LOOK AT THE EFFECT OF FEDERAL TAX LAWS ON OPTIMAL MACHINERY REPLACEMENT

Larry W. VanTassell and Clair J. Nixon

Abstract

Self-employment taxes, "effective" marginal tax rates, and discounting schemes which allow for alternative purchase and disposal dates of machinery are incorporated into the traditional optimal replacement interval model. Empirical results indicate that these alterations decrease the optimal replacement intervals by up to three years from those obtained with traditional modeling assumptions. Inclusion of self-employment taxes decreases both the penalty attached to early replacement and the net present value (cost) of tractor ownership.

Key words: replacement, income taxes, self-employment taxes.

Considerable research over the last three decades has centered on optimal machinery replacement. Throughout the 1960s and early 1970s much of the effort was concerned with establishing the proper criteria for determining an optimal replacement pattern (Burt; Chisholm, 1966; Faris; Perrin; Winder and Trant). Chisholm (1974) was the first to highlight tax issues when he developed a model for determining optimal replacement intervals and the effect income tax policies have upon them. Given U.S. income tax regulations, he found an 11-year replacement policy to be optimal for most circumstances. Chisholm concluded that the depreciation method used and the existence of additional first-year depreciation or investment credit did not affect the results.

Kay and Rister identified several reasons why Chisholm's optimal replacement ages were much higher than those which actually occurred in practice, with the primary factors being the pattern of repair costs and machinery breakdown. After refining Chisholm's model, they also found that first-year depreciation and investment credit reduced the optimal replacement age by one to four years.

Bates et al. extended the "tax-adjusted replacement model" by incorporating the interaction between taxes and inflation in their study. They found that inflation increased the magnitude of costs and generally extended the optimal replacement age.

More recently Reid and Bradford introduced an innovative replacement value forecast and examined the effect of the Economic Recovery Tax Act of 1981 (ERTA-81) on optimal succession between the old "defender" tractor and new or "challenger" tractor. As with Kay and Rister, they found investment tax credit to be the most important tax incentive to early machinery replacement, with optional replacement intervals ranging from five to 10 years.

While federal tax issues have been highlighted in the aforementioned studies, some important tax modeling issues have yet to be addressed. The objective of this paper is to identify some tax modeling issues overlooked in previous studies and assess their effect on optimal tractor replacement age under current tax laws.

Current Tax Laws

The Internal Revenue Code (IRC), as modified by the Tax Reform Act of 1986 (TRA), altered machinery replacement aspects in several ways. First, the investment tax credit (ITC) was eliminated, and the recovery life of most farm assets was extended. For example, most farm equipment and machinery now have a seven-year recovery period under the modified accelerated cost recovery system (MACRS). TRA further decreased first-year depreciation by amending the half-year convention with a mid-quarter convention when more than 40 percent of qualifying assets are purchased in the last quarter of the year. To compensate for these changes, IRC Section 179 (expensing) was increased to $10,000 annually, and the 150-percent declining-balance depreciation

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alternative was increased to a 200-percent declining-balance method (subsequently changed back to 150 percent by the Technical and Miscellaneous Revenue Act of 1988). Along with maintaining traditional straight line as a depreciation possibility, TRA provided an alternative straight-line option known as alternative MACRS (a straight-line method with an extended recovery period). TRA also changed the depreciation allowance in the year of disposal. Depreciation was previously not allowed in the year the machine was sold. Under TRA, one-half the applicable depreciation is allowed in the year of disposal (assuming the year of purchase and year of disposal are separate). Lastly, under TRA, marginal tax rates were decreased, tax brackets widened, and income averaging discontinued.

The overall effect of TRA on machinery replacement intervals was to increase the optimal age of replacement as recently shown by Weersink and Stauber. Using a stochastic dynamic programming model, they found optimal replacement intervals for grain combines increased from five years under ERTA-81, to seven years under TRA.

An Overlooked Tax

The self-employment tax has not been addressed in the machinery replacement models previously cited in this paper. Farmers operating as sole proprietors or in a partnership are required to pay self-employment taxes on net profits reported on IRS Form 1040 Schedule F. Farmers were first required to pay self-employment taxes on their 1955 earnings (Jeremias and Durst), with the tax rate of 3.0 percent and a maximum taxable income of $4,200. This rate has increased substantially since 1955. In the mid 1970s when Chisholm (1974), and then Kay and Rister were examining the effect of taxes on optimal machinery replacement, the self-employment tax rate was 7.9 percent on a maximum taxable income of approximately $14,000. In 1983, the Social Security Amendments Act (SSAA) outlined a series of self-employment tax increases which raised the tax from 9.35 percent in 1983 to 13.02 percent in 1988 (Government Printing Office). This rate will increase to 15.03 percent in 1990. To equate the Social Security tax burden between wage and self-employment income, self-employed workers will be allowed an income tax deduction of one-half the self-employment tax, plus a Social Security tax exemption of 7.65 percent of earnings eligible for self-employment taxes

(Jeremias and Durst). For many lower- and middle-income farm operators, annual self-employment liabilities are greater than their annual federal income tax liability.

Examining the nature of net income eligible for self-employment taxation is important to understanding its overall effect on optimal machinery replacement. Sales of depreciable farm assets in excess of tax basis generate depreciation recapture, which is not considered part of net farm income reported on Schedule F. Yet, depreciation deductions (expensing included) decrease Schedule F income. Depreciation deductions will thus reduce self-employment taxes, but depreciation recapture will not increase it. While the 7.9-percent self-employment tax in the mid 1970s may not have amounted to a large oversight when examining machinery replacement, the current 13- to 15-percent self-employment tax along with a $48,000 maximum (1989) on eligible income may have a significant effect on machinery replacement intervals.

PROCEDURE

Previous replacement studies by Chisholm (1974), Kay and Rister, and Reid and Bradford have followed Perrin's suggestion of calculating present values for each possible replacement year using the following model adapted to current tax laws:

$$(1) \quad PV_n = \frac{1}{1-(1+r)^{-n}} \{ [C_o - RV_n (1+r)^{-n}]$$
$$+ [1-T] \left[\sum_{k=1}^{n} R_k (1+r)^{-k} \right] - [(T) [E(1+r)^{-1}]$$
$$- [T \sum_{k=1}^{n} D_k (1+r)^{-k}] + (T) [(RC_n) (1+r)^{-n}] \},$$

where PV_n = present value (cost) of a perpetual replacement strategy of n years; C_o = original purchase price of the tractor; RV_n = market value of the tractor at the end of year n; r = after-tax discount rate; T = marginal tax rate; R_k = repair costs plus opportunity cost of breakdowns in year k; E = IRC Section 179 expensing; D_k = tax depreciation in year k; and RC_n = income from the disposition of the tractor at the end of n years which is subject to depreciation recapture. An infinite time horizon is assumed with cash flows from each tractor in the infinite process being the same. The optimal replacement interval is thus defined as the replacement age (n) which minimizes the present value of costs (PV_n).

Self-employment Taxes

To incorporate self-employment taxes into equation (1), the marginal self-employment tax rate (ST) is added to the marginal tax rate where appropriate. The self-employment tax may be considered marginal in the sense that as one's income approaches or surpasses the maximum income subject to self-employment taxes, only a partial (or zero) savings in self-employment tax liability may ensue from depreciation, repair costs, and expensing.

Treating the self-employment tax in the same manner as an income tax is an unconventional assumption, but one which is becoming more readily accepted (Musgrave and Musgrave). One reason is that Social Security benefits are no longer viewed strictly as an income transfer since the Tax Reform Act of 1984 changed the taxable status of these benefits so that currently one-half of Social Security income is included in taxable income. Secondly, recent studies of expected Social Security benefits have shown the present value of benefits for most households is only 15 to 30 cents per dollar of taxes paid (Boskin et al.). For many young farmers, Social Security contributions may be correctly viewed as taxes with the marginal linkage being zero in the first decade or so of contributions (Jeremias and Durst, Boskin et al.). However viewed, it is difficult to divorce income and self-employment taxes when talking about machinery replacement decisions, as both are affected by depreciation, IRC Section 179 expensing, and repair costs. While no study has been conducted to determine if farmers view self-employment taxes in the same manner as income taxes, it is assumed in this study that the farmer wishes to minimize both.

Discounting and Tax Flows

Traditional replacement models such as equation (1) assume a January 1 purchase date with repair and other costs due December 31 in the same year. If this assumption is relaxed, and the time spans covered by the replacement year and tax year (denoted Y^R_k and Y^T_k, respectively, with $k = 1, ..., n$ years the machine is in service) do not coincide, repair and other costs during any particular replacement year Y^R_k will occur over two tax years, Y^T_k and Y^T_{k+1}. For example, if Y^T_k follows a calendar tax year and a farmer purchases a tractor on April 1, with Y^R_k going from April 1 through the following March 31, repair costs incurred April through December would be subtracted from taxable income in tax year Y^T_k with the ensuing tax deduction discounted approximately 0.8 of a

year. The remainder of repair costs incurred in Y^R_k (January through March) would be figured in Y^T_{k+1}'s taxable income and discounted 1.8 years. While in some instances this may be a minute point, if repair and other costs are substantial and marginal tax brackets change from year to year, it could be a significant factor.

To incorporate the discounting of repair and other costs when tax and replacement years do not coincide, those costs occurring in replacement year k must be appropriately allocated to the tax year in which they occur and be discounted accordingly. This can be accomplished by expanding the tax treatment of repair costs in equation (1) to:

$$(2) \quad -[\sum_{k=1}^{n} p(T'_k + ST'_k)R_k(1+r)^{-k+1-d} + (1-p)$$
$$(T''_k + ST''_k)R_k(1+r)^{-k-d}],$$

where T, ST, R_k, r, and k are as previously defined; d = percentage of year from purchase until tax payment (e.g., if taxes were due January 15 and a machine was purchased the previous September 15, d would equal 4/12 or .333); p = percentage of costs from Y^R_k occurring in Y^T_k; and '('') = marginal tax rate associated with Y^T_k (Y^T_{k+1}).

The concept of overlapping tax and replacement years can also be applied to the amount of depreciation taken. In the year of disposal, only one-half the applicable depreciation is allowed (no depreciation under pre-TRA law) according to the IRC. Another interesting point is that if a depreciable asset is purchased and sold within the same tax year, no depreciation is allowed. If however, the tax and replacement years do not coincide and a depreciable asset is sold at the end of Y^R_1, allowable depreciation for Y^T_1 can be taken, along with half of the depreciation applicable for Y^T_2. By thus staggering replacement and tax years, additional depreciation can usually be taken if the tractor is not sold before its recovery period has elapsed. Although some of the gains from this extra depreciation may be lost through depreciation recapture, the timing of the flows will have been changed. Incorporating these concepts into equation (1), the depreciation portion can be rewritten as:

$$(3) \quad -[\sum_{k=1}^{n} (T'_k + ST'_k)(D_k(1+r)^{-k+1-d}]$$
$$- [(T''_n + ST''_n).5D_{n+1}(1+r)^{-n-d}],$$

where D_k is the depreciation applicable in Y^T_k, D_{n+1} is the depreciation applicable in Y^T_{n+1}, and all other variables are as previously defined.

The discounting scheme must also be altered for depreciation recapture if replacement and tax years do not coincide. Following a January 1 through December 31 replacement and tax year, recapture from selling a machine on December 31 in year n would only be discounted a few weeks until the tax payment was due. Overlapping the replacement and tax year would defer the recapture reimbursement until Y^T_{n+1}'s tax payment was due. For example, with taxes on a calendar year basis and Y^R extending from January 15 in year k to January 15 in year k+1, depreciation recapture from selling a machine on January 14 in year n would not be due for 12 to 14 months. Incorporation of this discounting scheme into equation (1) results in:

$$(4) + (T''_n)[(RC_{n+1})(1+r)^{-n-d}] ,$$

where RC_{n+1} is the recapture associated with Y^T_{n+1} and all other variables are as previously defined.

The appropriate time factor, d, for discounting tax flows is dependent not only upon the purchase date of the new machine but also the date tax payments are due. Farmers (sole proprietors or partnerships) using a calendar tax year can either make an estimated tax payment by January 15 with the actual return due April 15, or they can file their return and pay the appropriate taxes by March 1. In this study it is assumed that farmers follow the first option and therefore tax payments are considered due January 15.

Effective Tax Rates

Constant marginal tax rates have been used in replacement studies cited in this paper. While this assumption is probably more valid under TRA (because of the wider tax brackets) than under previous tax laws, it still can be a critical assumption in a machinery replacement study. Tax brackets in the purchase and disposal years can differ significantly from other years because of the expensing deduction and depreciation assessments. Depreciation recapture in the year of disposal can easily increase taxable income by large amounts on expensive, well-maintained machinery. This could result in a change, for example, from a 15-percent marginal tax rate to a 28-percent rate. With income averaging now discarded, farmers can no longer average these income abnormalities out over several years. To more accurately assess the farmer's tax liabilities, an "effective" marginal tax rate determined for each year is needed. An "effective" marginal tax rate is defined as the weighted average between income tax payable on income before recapture, expensing, depreciation, and self-employment tax adjustments to taxable income are considered, and the income tax associated with income after these investment incentives and tax liabilities are accounted for. Of course, when determining the "effective" marginal tax rate under a January through December replacement scheme, it must be remembered that recapture from the defender and expensing from the challenger will occur in the same year and therefore may partially offset any tax bracket increase.

The Simulation Model

Integrating the preceding changes into equation (1) gives:

$$(5) \quad PV_n = \frac{1}{1-(1+r)^{-n}}\{[C_o - RV_n(1+r)^{-n}] + [\sum_{k=1}^{n} R_k(1+r)^{-k}]$$

$$-[\sum_{k=1}^{n} p(T'_k + ST'_k)R_k(1+r)^{-k+1-d} + (1-p)(T''_k + ST''_k)R_k(1+r)^{-k-d}]$$

$$-[(T'_1 + ST'_1)[E(1+r)^{-d}]$$

$$-\sum_{k=1}^{n}(T'_k + ST'_k)(D_k(1+r)^{-k+1-d}] - [(T''_n + ST''_n).5D_{n+1}(1+r)^{-n-d}]$$

$$+(T''_n)[(RC_{n+1})(1+r)^{-n-d}]\} ,$$

where T_k = the "effective" marginal tax rate associated with Y^T_k and all other variables are as previously defined.

Schedule Y for married couples is incorporated in the model to determine the "effective" marginal tax rate. Each year's self-employment rate is used to determine the reduced self-employment tax derived from expensing and depreciation. If the income eligible for self-employment tax before any deductions for depreciation or expensing is greater than the maximum wage base, then only the difference, if any, between the maximum base and eligible income (after deducting depreciation and expensing) is used to determine self-employment tax savings. The appropriate income tax credit ensuing from the self-employment tax is also determined for years after 1989 and enters into the calculation of the "effective" marginal tax rate.

Remaining value of the tractor is estimated as (Reid and Bradford):

$$(6) \quad RV = 368.7(N)^{-.273}(HP)^{.242}(NF)^{-.305}(C_o) ,$$

with repair costs and breakdown time following (American Society of Agricultural Engineers, p. 254):

$$(7) \quad CR = 0.012(HR/1000)^{2.033}, \text{ and}$$

(8) $DT = 0.0003234(HR)^{1.4173}$,

where RV = the remaining value of the tractor; N = age of tractor in years; HP = horsepower, PTO rating; NF = realized net farm income per farm (1967 dollars); C_o = original purchase price of the tractor; CR = accumulated costs of repair; HR = accumulated hours of use; and DT = accumulated hours of breakdown time.

Repair costs are assumed to be evenly distributed throughout the year and paid at the end of each tax year. An interest charge is assessed against each unpaid repair bill with an assumed cost of capital of 10 percent.

Optimal replacement time is examined for 55-horsepower and 115-horsepower tractors. The purchase price of a new 55-horsepower tractor is assumed to be $22,000, while the 155-horsepower tractor is valued at $46,000 (National Farm and Power Equipment Dealers Association). Yearly hours of operation are assumed to be 800 with an opportunity cost of $30 and $60 per breakdown hour for 55- and 115-horsepower tractors, respectively (Reid and Bradford). The average U.S. net farm income from 1984 to 1986 ($4,897, 1967 dollars) is used in the remaining value equation (U.S. Department of Agriculture).

Optimal replacement intervals are determined assuming after-tax discount rates of three and nine percent (Reid and Bradford), along with income levels of $25,000, $50,000, and $100,000. The $25,000 income level is associated with a 15-percent marginal tax rate, while the $50,000 and $100,000 income levels coincide with 28- and 33-percent marginal tax rates, respectively.

RESULTS

The traditional replacement model (Model 1) assumes the tractor is purchased on January 1 and sold December 31 in the associated replacement year, with the discounting and tax flow scheme following equation (1). Model 2 is associated with the discounting scheme of equation (5) with the assumption that the machine is purchased on January 15 and disposed of on January 15 in the year of replacement.[1] The associated net present value of tax savings occurring for each scenario or combination of income level, discount rate, and tractor size is maximized when expensing and MACRS depreciation (150-percent declining balance, half-year convention) are elected, and, therefore, only these scenarios are presented.

Minimum net present values (costs) and their corresponding replacement intervals (given in parentheses) for Models 1 and 2, with and without the self-employment tax, are shown in Table 1.[2] The discounting and tax flow scheme of Model 2 shortened the optimal replacement age below those obtained using Model 1 in several of the scenarios. The largest difference, with intervals being reduced by up to three years, occurred for the 115-horsepower tractor. Using Model 1, a nine-year replacement interval was obtained for the 115-horsepower tractor at a 9-percent discount rate. The optimal replacement interval decreased to either six or seven years, depending upon the income level, when determined by Model 2. This decrease in replacement age was typically accompanied by a decrease in net present value of $1,000 or less. The "effective" marginal tax rate obtained by the $25,000 income level reached 24 percent under Model 1 in the year recapture was assessed, compared to 17 percent for Model 2. It was therefore more advantageous under Model 1 to delay disposal until the remaining value of the tractor further diminished. "Effective" marginal tax rates did not change for the $50,000 or $100,000 income levels under either of the models. The discounting scheme of Model 2 extended the tax liability of recapture another year, though, regardless of income level. Ability to obtain one-half of an additional year's depreciation by selling January 15 as opposed to December 31 also tended to shorten replacement intervals for Model 2.

The difference between Models 1 and 2 was less drastic for the 55-horsepower tractor, whose smaller price tag created a reduced depreciable basis and recapture which translated into de-

[1] While different present values can be obtained by choosing dates other than January 15, the important concept is that the replacement year's time span (e.g., buy January 15 and sell January 15) be different than the farmer's tax year (e.g., January 1 to December 31). Sensitivity analysis by the authors shows that while dates other than January 15 give slightly different net present values, their replacement intervals coincided with those obtained by using the January 15 date.

[2] For the 115-horsepower tractor, the optimal replacement interval was always one year. This result was a function of the small decline in resale value which was obtained from Reid and Bradford's remaining value equation for 115-horsepower tractors after one year of service. A comparison of Reid and Bradford's first-year resale value with an industry record (National Farm and Power Equipment Dealers Association) indicated that Reid and Bradford's first-year resale value was overstated. Other remaining value equations (American Society of Agricultural Engineers) provided first-year resale values which were more in line with the industry record and which made year 1 replacement undesirable. Replacement values in subsequent years from Reid and Bradford's equation were more in line with the industry average than the other equations examined, and therefore the authors chose to discard replacement options of 1 year for the 115-horsepower tractor and use Reid and Bradford's remaining equation formula to examine the sensitivity of replacement intervals.

TABLE 1. EFFECTS OF DISCOUNTING SCHEMES AND SELF-EMPLOYMENT TAXES ON OPTIMAL
REPLACEMENT DECISIONS[a,b]

Income	Discount Rate (%)	Horsepower	Minimum Net Present Value ($) Without Self-employment Tax		Minimum Net Present Value ($) With Self-employment Tax	
			Model 1[c]	Model 2	Model 1	Model 2
25,000	9	115	95,604(9)	95,588(6)	81,986(9)	81,029(6)
50,000	9	115	83,303(9)	82,347(7)	77,203(9)	75,862(7)
100,000	9	115	78,978(9)	77,919(6)	78,978(9)	77,919(6)
25,000	3	115	223,649(7)	218,844(6)	183,206(7)	175,290(6)
50,000	3	115	191,047(8)	180,127(6)	173,035(8)	161,528(6)
100,000	3	115	179,680(9)	167,678(6)	179,680(9)	167,678(6)
25,000	9	55	46,330(9)	46,582(9)	39,542(9)	39,544(8)
50,000	9	55	40,448(9)	40,248(9)	38,995(9)	38,792(8)
100,000	9	55	38,201(9)	37,965(9)	38,201(9)	37,965(9)
25,000	3	55	111,059(8)	111,697(7)	91,140(8)	89,782(6)
50,000	3	55	95,532(9)	93,689(7)	91,605(8)	88,666(6)
100,000	3	55	83,398(9)	87,356(6)	89,398(9)	87,356(6)

[a] Optimal replacement ages in years are shown in parentheses.
[b] MACRS depreciation and IRC Section 179 expensing assumed.
[c] Model 1 incorporates the traditional January 1 through December 31 replacement scheme of equation (1). Model 2 incorporates a January 15 through January 15 replacement scheme using equation (5).

creased tax flows. For example, recapture was small enough with the 55-horsepower tractor so as to not increase the "effective" marginal tax rate above 15 percent for the $25,000 income level in either of the models.

As was shown by Reid and Bradford, lower discount rates generally resulted in shorter replacement intervals because the opportunity costs of tractor longevity were greater than with a higher discount rate. Independent of the tractor size or income level, the optimum replacement interval obtained under a 9-percent discount rate was nine years for Model 1. With a 3-percent discount rate, replacement intervals tended to drop by one year in most cases. While there was more variation under Model 2, most replacement intervals decreased by one or two years when the discount rate was dropped to three percent. The increased difference in replacement intervals between the two interest rates under Model 2 occurred because of the extended discounting scheme employed.

Optimal replacement intervals for both models varied little when self-employment taxes were included. In most cases though, a substantial decrease in net present value of costs did occur, the largest being more than $44,000. Accounting for self-employment taxes greatly diminished the overall tax advantages of higher income brackets. Because the $25,000 income level was below the self-employment income cap of $45,000, all tax deductions lowered this

liability. An income level of $50,000 was $5,000 over the cap, and, therefore, not all expensing and depreciation amounts were capable of reducing self-employment taxes. Accounting for the self-employment tax made no difference in tax savings for the $100,000 income level because it was far above the self-employment income cap.

Although optimal replacement intervals generally remained unchanged when self-employment taxes were included, the penalty for early replacement was diminished, and the penalty for replacement beyond the optimal age was enlarged. For example, an operator earning $25,000 with a 3-percent discount rate and a 115-horsepower tractor had a six-year optimal replacement interval under Model 2, whether self-employment taxes were included or not. As is shown in Table 2, the penalty for earlier replacement was less when self-employment taxes were considered than when they were not. This was especially true during the first four years of ownership when benefits from expensing and depreciation were greatest. A larger penalty was attached to replacement ages beyond the optimal interval because of the additional self-employment tax savings foregone by not replacing.

CONCLUDING REMARKS

The exclusion of discounting schemes which allow for a more authentic treatment of depre-

TABLE 2. INCREASE IN NET PRESENT VALUE (COST) WHEN REPLACEMENT OCCURS OTHER THAN IN THE OPTIMAL REPLACEMENT INTERVAL OF SIX YEARS, WITH AND WITHOUT THE INCLUSION OF SELF-EMPLOYMENT (SE) TAXES[a]

Year of Replacement	Increase in Net Present Value ($) Without SE Tax	With SE Tax	Year of Replacement	Increase in Net Present Value ($) Without SE Tax	With SE Tax
2	24,647	11,598	9	10,690	12,753
3	14,671	9,137	10	14,628	17,074
4	5,126	3,231	11	19,601	22,065
5	765	349	12	25,353	27,563
6	0	0	13	31,699	33,451
7	4,019	4,303	14	38,503	39,640
8	8,154	9,321	15	45,662	46,062

[a] Optimal replacement interval of six years is for a 115-horsepower tractor assuming a three-percent discount rate and a $25,000 income level.

ciation assessment and recapture liabilities appears to have been an important oversight in previous replacement studies. By including these concepts, optimal replacement occurred in as few as every six years, depending upon the income level, discount rate, and tractor size assumed. While TRA has been shown to increase the optimal replacement intervals above previous tax laws (Weersink and Stauber), the replacement intervals obtained under the expanded model specifications were still generally shorter than had previously been determined by Reid and Bradford.

The inclusion of self-employment taxes into the study had a minor effect in decreasing the optimal replacement intervals. However, the cost of machinery ownership, particularly the relative cost between income levels, was diminished considerably when self-employment taxes were accounted for. Recognition of self-employment tax savings also presented less of a penalty on early replacement for income levels below the self-employment income cap.

Several questions about optimal replacement intervals and the effect tax policy has upon them are in need of further research. One limitation of this study was the assumption of a constant level of income. Because this rarely occurs, the value of tax deductions to a farmer in any particular year is questionable. Variability in income may negate a farmer's ability to utilize all tax deductions, while an increase in taxable income may make early replacement more profitable.

Another limitation of this study was the uncertainty as to a farmer's desire to decrease self-employment tax payments. Further work is needed to determine if farmers view self-employment taxes in the same light as income taxes or if self-employment taxes are considered at all in their decision-making process.

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