Machinery Replacement Decisions and the Tax Reform Act of 1986

by

Larry W. VanTassell and Clair J. Nixon

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* Larry W. VanTassell is an Assistant Professor, Department of Agricultural Economics, University of Tennessee. Clair J. Nixon is an Associate Professor, Department of Accounting, Texas A&M University.
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abstract

The decision to trade or sell equipment when purchasing new equipment is examined using a computer simulation model. Income and self-employment tax rates reflecting the current law are integrated into the model. The most profitable alternative prescribed is to sell, elect expensing, and use modified accelerated depreciation. The change in the optimum solution is also examined when various tax modeling methodologies are employed.
The Tax Reform Act of 1986 (TRA) has been referred to as the "most sweeping revision of the tax code since 1954" (USDA, p.61). While the personal and standard deductions were increased and marginal tax rates were decreased, several changes occurred which may cause a farmer's taxes to increase. Among these are the loss of investment tax credit and longer recovery periods for asset depreciation. To obtain maximum benefits from the new tax law, farmers need to pay close attention to the methods they choose when divesting and purchasing new depreciable assets. The purpose of this study is to: 1) examine the current tax law with respect to machinery replacement--specifically, should a farm operator trade or sell when divesting and purchasing new depreciable assets; 2) develop a present value model which incorporates the current tax law alternatives and their relevant cash flows in order to determine the optimum strategy; 3) examine the sensitivity of the optimum strategy to changes in relevant variables; and 4) address the implications that various tax modeling methods have upon the optimum solution.

Current Tax Laws Affecting Machinery Replacement

When a farm operator replaces a machine, he can either sell it or use it as a trade-in. These two disinvestment alternatives are treated differently under current tax laws. One way this difference occurs is through the basis which is assigned a new investment. When the sale of the old asset is independent of the purchase of the new asset, the basis for the new asset is usually its cost. To classify the disinvestment as a sale, the machine cannot be sold to the party from which the new machine is being purchased. If this occurs without a significant time period transpiring, the IRS considers the purchase and sale dependent upon each other, and the transaction must be classified as a trade. A trade of "like kind" exchange
occurs when two assets of the same nature are exchanged. When a trade occurs, the basis for the new machine is the adjusted basis of the machine traded, plus the "boot" or additional cash paid on the new machine. Thus, with an exchange, the basis is generally smaller. A large basis is important since it translates into greater tax depreciation deductions.

The Tax Reform Act of 1986 allows farmers to use either the modified accelerated cost recovery system (MACRS) or Alternative MACRS for determining depreciation. The MACRS depreciation method provides a choice between accelerated (a declining balance method which switches to straight line to maximize depreciation) or straight line recovery. The Alternative MACRS option is a straight line method which uses an extended recovery period. TRA also extended the class life of most farm machinery either five (e.g. light truck) or seven years (e.g. tractor). No reduction in salvage value is required by any method. TRA also made an attempt to further decrease first year depreciation by amending the half-year convention with a mid-quarter convention when 40 percent of assets are purchased in the last quarter of the year. While TRA repealed the investment tax credit, Section 179 expensing option was increased to $10,000.

Although the sale option generally benefits more from depreciation due to a higher adjusted tax basis, the trade option benefits since it does not have to account for depreciation recapture. When machinery is sold for more than its adjusted tax basis, depreciation recapture occurs. The difference between selling price and adjusted tax basis is usually added to ordinary taxable income in the year of the sale. Hence, depreciation recapture can significantly increase the marginal income tax bracket of the farm operator in the year of the sale, especially on well maintained, expensive machinery. In the past, the effect of large increases in taxable
income from selling farm machinery could have been partially offset by the use of income averaging, but income averaging has been eliminated under TRA.

An often overlooked part of tax management is the self-employment tax. Not only does depreciation and expensing decrease the taxable income from which income tax is calculated, but they also decrease the self-employment income from which the self-employment tax is determined. This can result in significant savings, especially since the Social Security Amendments Act of 1983 (SSAA) increased both the rate and maximum bases for the self-employment tax. For 1988 and 1989, farm operators and other self-employed individuals will face a 13.02 percent self-employment tax rate. This rate will increase in 1990 to 15.03 percent with an taxable income deduction of one-half the self-employment tax. For 1988 the maximum income eligible for self-employment tax will be increased 45,000, with future years being increased by the rate of inflation.

The nature of the self-employment tax is important in understanding its overall effect on a farm operator's tax liability. The self-employment tax is based on a farm operator's net farm income. This is not necessarily the same as this total taxable income from farm related activities. The gain on the sale of capital assets, for example, is not considered part of net farm income for self-employment tax purposes but is still part of the farm operator's overall taxable income. In addition, while depreciation deductions reduce the farm operator's net farm income for self-employment tax purposes and the recapture of this depreciation on disposition is part of ordinary income, such recapture is not considered self-employment income. Thus, depreciation deductions reduce self-employment taxes but depreciation recapture does not increase it.
Decision Model

The decision a farm operator has to make is whether increased annual depreciation allowances available when selling old equipment are greater than the benefits of not having to recognize depreciation recapture when using the trade option. To determine the optimal strategy (trade vs sale; expensing vs not expensing; accelerated vs straight line vs alternative MACRS) for a farm operator, a net present value model was developed with the mathematical representation of the present value equations as follows:

\[
NPV_{SALe} = \text{EXP} \sum_{t=1}^{N} \frac{\text{DRATE}_t \times \text{ABS}_t \times (\text{MTR}_t + \text{SER}_t)}{(1+i)^t} - (\text{FMVS} - \text{BO}) \times \text{MTR}_t
\]

\[
NPV_{TRADE} = \text{EXP} \sum_{t=1}^{N} \frac{\text{DRATE}_t \times \text{ABT}_t \times (\text{MTR}_t + \text{SER}_t)}{(1+i)^t}
\]

Where:

- \( \text{MTR}_t \) = "Effective" marginal tax rate in time \( t \) from tax schedule \( Y \)
- \( \text{ABS}_t \) = Adjusted basis for the sale option (\( \text{BS} - \text{EXP} \))
- \( \text{ABT}_t \) = Adjusted basis for the trade option (\( \text{BT} - \text{EXP} \))
- \( \text{DRATE}_t \) = Depreciation rate used in time \( t \)
- \( \text{EXP} \) = Amount of expensing chosen (maximum of $10,000)
- \( \text{FMVS} \) = Fair market value of the machine being replaced
- \( i \) = After tax discount rate
- \( N \) = Depreciation recovery period (8 years for accelerated and straight line; 11 years for alternative MACRS)
- \( \text{SER}_t \) = Self-employment tax rate in period \( t \)
- \( \text{BO} \) = Existing basis of machine being replaced
- \( \text{BS} \) = Basis of new machine purchased under the sale option (purchase price)
- \( \text{ST} \) = Basis of the new machine purchased under the trade option (\( \text{BO} + \text{boot} \))

The above equations assume that no differences exist between the trade-in and market value of the machine being replaced, and that the price of the new machine is the same with or without trade-in. Any price advantages existing must be added to the appropriate equation.

The true income tax savings accruing from depreciation and expensing is the difference between the income tax owed before these business incen-
tive provisions are deducted and the income tax due after they are sub-
tracted. These savings can be determined by multiplying the amount of
depreciation and expensing by the "effective" marginal tax rate (a weighted
average between the income tax payable on income before these business
incentive provisions are deducted, and the income tax associated with
income after these deductions). The "effective" marginal tax rate formul-
ation is crucial since the first-year tax bracket can differ dramatically
depending upon whether the old machine is traded or sold. Taxable income
in subsequent years will also vary because the adjusted basis used to
figure depreciation on the machine will differ according to whether it was
acquired via a trade-in or direct purchase.

Income eligible for the self-employment tax is also recalculated each
year. Eligible income includes gross income less income generated from the
sale of assets, including depreciation recapture and capital gains. Each
year's self-employment tax 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 maximum self-employment tax base is automatically adjusted
each year according to a cost of living adjustment in the wage base. For
purpose of this model, the adjustment has a constant growth rate over the
simulation period.

Case Example

A case farm example was developed to demonstrate the tax implications
to a farm operator when choosing between selling and trading an old machine
as a new one is purchased. In the example, a farm operator wishes to purchase a new tractor that retails for $50,000. The fair market value of the farmer's seven-year-old tractor is $21,000, with an adjusted tax basis of $0. The farm operator's projected current year's taxable income, irrespective of the purchases of the new tractor, is $24,000. The farm operator assumes that income will grow by four percent annually, and the after-tax discount rate is ten percent. In addition, the sales price of the old tractor ($21,000) is assumed to be equal to its trade-in value.

Results

Results from the combination of practices which provide the farm operator with the greatest net present value of tax savings are shown in Table 1. The optimal strategy to pursue in this case example is to sell the old tractor when purchasing the new tractor, elect expensing, and use MACRS depreciation. The net present value of tax savings from this alternative was $9189 compared to $7506 from the optimal trade strategy.

The marginal tax rate facing the sale option was a major factor in determining the tax strategy taken. The $24,000 beginning taxable income was associated with a 15 percent marginal tax bracket. After adding $21,000 for depreciation recapture and deducting $10,000 for expensing and $5,716 for depreciation, taxable income was increased to $29,284. While a 28 percent marginal tax rate resulted, the "effective" marginal tax rate for the farm operator was 18.2 percent. This 18.2 percent rate was used to calculate the first year tax savings from expensing and depreciation as well as the $3,813 addition to taxes from depreciation recapture. The major factor influencing the sale versus trade option was treatment of the self-employment tax. There were $2,374 of additional self-employment tax savings to the farm operator through a reduced net farm income via the
larger depreciation deductions available under the sale option.

The trade option, while being less financially attractive to the farm operator, followed the same strategy as far as electing expensing and choosing accelerated depreciation. The decision of whether to expense was not as clear cut under the trade option as with the sale option. This result is related to the marginal tax bracket of the farm operator. Unlike the sale option, where the sale of the old machine significantly increased income, the trade option did not. This encouraged spreading of the tax deductions into later years when there would be fewer deductions and more income.

Both the trade and sale options utilized modified accelerated depreciation. The net present value of tax savings from depreciation was $2,806 greater under the sale versus the trade option (Table 1). This advantage for the sale option was attributed to the higher adjusted basis.

Sensitivity of the Solution

Sensitivity of the solution to changes in selected variables is presented in Table 2. As expected, the present value of tax savings from both options increased as the farm operator's after-tax discount rate decreased. The 50 percent decrease in the after-tax discount rate amounted to over a nine percent increase in the net present value of tax savings from each option. The difference in present value between the trade versus sale option also widened. This reflected the increased time value of additional tax savings obtained from depreciation for the sale option. The decreased discount rate also made it advantageous to use alternative MACRS depreciation for the trade option.

When growth in taxable income was held constant, the difference between the two options decreased due to the reduction in marginal tax
rates. This made the larger depreciation deductions of the sale option less valuable.

When the basis of the old tractor was increased to $8,000, the marginal tax rate for the first period decreased under both options. This occurred for the sale option because of a decrease in taxable income from the additional depreciation recapture. The decreased marginal tax rate had the effect of decreasing income tax savings from depreciation and expensing for the sale option, but it also decreased the tax due to depreciation recapture. The marginal tax rate decreased for the trade option because the depreciable basis was reduced. This resulted in increased depreciation expense in all years and in increased self-employment tax savings.

As fair market value of the old tractor decreased, tax advantages of both options increased with the largest percentage change benefiting the trade option. The tax savings increased for the sale option because of the decreased depreciation recapture. For the trade option, the adjusted basis was increased which meant an increase in depreciation allowances.

When the base income level was raised to $35,000, the same tendencies between the trade and sale options were exhibited as when the income was $24,000. The farm operator in this example would be better off not to elect expensing if the trade option were chosen. The percentage change from the base conditions was extended somewhat because of the increased marginal tax rates.

Effect of Tax Modeling Alternatives

Several studies examining tax effects upon machinery replacement or optimum tax strategies have omitted the self-employment tax and/or also assumed a constant marginal tax rate (Lybecker and King; Chisholm; Kay and Lippke; Kay and Rister; Reid and Bradford). To examine the severity of
excluding these principles from tax simulation studies, the case example used in this study was examined omitting these points (Table 3).

When a constant marginal tax rate of 15 percent was assumed, the present value of the trade and sale options decreased. While the 15 marginal tax rate equaled the marginal tax rate obtained from the actual income levels in most years, it was below the "effective" marginal tax rate used to assess the value of the tax flows in several critical years. The full tax savings from expensing and depreciation were thus underestimated. This was especially true in year one where recapture increased taxable income. When an "effective" marginal tax rate was used, expensing was more valuable as a tax tool to avoid a higher marginal tax bracket. This is shown in the decreased differences between the expensing and no expensing options when the constant tax rate was used.

Exclusion of the self-employment tax in this study reversed the optimal replacement decision to trade rather than sale, and greatly decreased the value of tax savings from machinery replacement. This reversal resulted because benefits from the increased depreciation available from the sale option decreased when the self-employment tax was ignored. Without the self-employment tax considerations, straight line and alternative MACRS were nearly as favorable as using MACRS for the trade option.

Conclusions

This study sheds light on the importance of examining the trade versus sale option when replacing depreciable farm assets. The importance of changes in the self-employment tax rates were also manifest throughout this study. While an farmer nearing retirement may not wish to minimize the self-employment tax paid, young farmers may do well to consider this strategy since the net present value of his future returns may be smaller than the value of those savings today (Jeremias and Durst).
TABLE 1. COMPARISON OF THE OPTIMAL\textsuperscript{a} TAX PRACTICES FOLLOWED BY THE SALE AND TRADE OPTIONS AND THEIR EFFECT ON TAXABLE INCOME, TAX RATES, AND YEARLY FLOWS FROM TAX SAVINGS\textsuperscript{b,c}

<table>
<thead>
<tr>
<th>Year</th>
<th>Taxable Income before Deductions</th>
<th>Taxable Income After Deductions</th>
<th>Effective Marginal Tax Rate</th>
<th>Present Value of Income Tax Savings from Depreciation</th>
<th>Present Value of Savings on Self-Employment Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sale</td>
<td>Trade</td>
<td>Sale</td>
<td>Trade</td>
<td>Sale</td>
</tr>
<tr>
<td>1</td>
<td>24,000</td>
<td>24,000</td>
<td>24,284</td>
<td>11,285</td>
<td>.182</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,038</td>
<td>407</td>
<td>2,046</td>
</tr>
<tr>
<td>2</td>
<td>24,960</td>
<td>24,960</td>
<td>15,165</td>
<td>20,307</td>
<td>.150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,336</td>
<td>634</td>
<td>1,159</td>
</tr>
<tr>
<td>3</td>
<td>25,958</td>
<td>25,958</td>
<td>19,497</td>
<td>22,889</td>
<td>.150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>867</td>
<td>412</td>
<td>885</td>
</tr>
<tr>
<td>4</td>
<td>26,997</td>
<td>26,997</td>
<td>22,381</td>
<td>24,804</td>
<td>.150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>563</td>
<td>263</td>
<td>574</td>
</tr>
<tr>
<td>5</td>
<td>28,077</td>
<td>28,077</td>
<td>24,780</td>
<td>26,511</td>
<td>.153</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>373</td>
<td>181</td>
<td>373</td>
</tr>
<tr>
<td>6</td>
<td>29,200</td>
<td>29,200</td>
<td>25,903</td>
<td>27,634</td>
<td>.197</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>437</td>
<td>263</td>
<td>339</td>
</tr>
<tr>
<td>7</td>
<td>30,368</td>
<td>30,368</td>
<td>27,070</td>
<td>28,801</td>
<td>.243</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>490</td>
<td>268</td>
<td>308</td>
</tr>
<tr>
<td>8</td>
<td>31,582</td>
<td>31,582</td>
<td>29,934</td>
<td>30,799</td>
<td>.280</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>256</td>
<td>122</td>
<td>140</td>
</tr>
</tbody>
</table>

\textsuperscript{a} The optimal tax strategy for both the sale and trade options was to elect expensing and use modified accelerated depreciation.

\textsuperscript{b} Accumulated tax savings associated with the optimal sale and trade options.

<table>
<thead>
<tr>
<th></th>
<th>Sale</th>
<th>Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Tax Saving from Expensing:</td>
<td>$1,816</td>
<td>$1,500</td>
</tr>
<tr>
<td>Depreciation Recapture:</td>
<td>(3,813)</td>
<td>0</td>
</tr>
<tr>
<td>Present Value of Accumulated Income Tax Savings from Depreciation:</td>
<td>5,361</td>
<td>2,555</td>
</tr>
<tr>
<td>Present Value of Accumulated Savings on the Self-Employment Tax</td>
<td>5,825</td>
<td>3,451</td>
</tr>
<tr>
<td></td>
<td>$9,190</td>
<td>$7,506</td>
</tr>
</tbody>
</table>

\textsuperscript{c} Accelerated depreciation was the optimal strategy for the sale and trade options. Adjusted basis for depreciation calculation was $40,000 for the sale option and $19,000 for the trade option.
### TABLE 2. NET PRESENT VALUE ($) OF THE OPTIMAL\(^{a}\) SALE AND TRADE TAX ALTERNATIVES AND THEIR PERCENTAGE CHANGE AS RELEVANT VARIABLES CHANGE

<table>
<thead>
<tr>
<th></th>
<th>Income = 24,000</th>
<th>Income = 35,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sale</td>
<td>Trade</td>
</tr>
<tr>
<td>Base Model(^{d})</td>
<td>9,189</td>
<td>7,506</td>
</tr>
<tr>
<td>I = 5%</td>
<td>10,415</td>
<td>8,199(^{b})</td>
</tr>
<tr>
<td>% changed from Base Model</td>
<td>13.34</td>
<td>9.23</td>
</tr>
<tr>
<td>GR = 0%</td>
<td>8,770</td>
<td>7,212</td>
</tr>
<tr>
<td>% changed from Base Model</td>
<td>-4.56</td>
<td>-3.92</td>
</tr>
<tr>
<td>Bo = $8,000</td>
<td>10,556</td>
<td>8,955</td>
</tr>
<tr>
<td>% Changed from Base Model</td>
<td>14.88</td>
<td>19.30</td>
</tr>
<tr>
<td>FMV = $15,000</td>
<td>10,256</td>
<td>8,955</td>
</tr>
<tr>
<td>% changed from Base Model</td>
<td>11.61</td>
<td>19.30</td>
</tr>
</tbody>
</table>

\(^{a}\) The optimal tax strategy (except those so footnoted) for all options was to expense $10,000, and use modified accelerated depreciation.

\(^{b}\) The optimal tax strategy differed from the norm by electing alternative MACRS depreciation.

\(^{c}\) The optimal tax strategy differed from the norm by not expensing.

\(^{d}\) Variables under assumed conditions are:
- Purchase price of new tractor: $50,000
- Fair market value of old asset (FMV): $21,000
- Basis of the old asset (Bo): $0
- After tax discount rate (I): 10\%
- Growth rate of income (GR): 4\%
- Growth rate of Self-employment tax base limit: 4\%
TABLE 3. COMPARISON OF VARIOUS TAX MODELING ALTERNATIVES AND THEIR EFFECT OF THE TRADE (T) OR SALE (S) DECISION.

<table>
<thead>
<tr>
<th>Expense = $10,000</th>
<th>Expense = 0%</th>
<th>Difference Between Optimal Sale and Trade Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC(^a) SL(^b) AMAC(^c)</td>
<td>MAC SL AMAC</td>
<td>MAC SL AMAC</td>
</tr>
<tr>
<td>Simulation Model</td>
<td>S 9,189(^#) 8,272 7,816</td>
<td>7,624 6,477 5,842</td>
</tr>
<tr>
<td></td>
<td>T 7,506 7,310 7,101</td>
<td>7,118 6,722 6,478</td>
</tr>
<tr>
<td>Simulation Model Without Self-employment Tax</td>
<td>S 3,364(^#) 2,684 2,694</td>
<td>1,970 1,120 1,067</td>
</tr>
<tr>
<td></td>
<td>T 4,055 3,972 3,985</td>
<td>3,839 3,615 3,709</td>
</tr>
<tr>
<td>Model with constant 15% marginal Tax Rate</td>
<td>S 8,937(^#) 8,319 7,343</td>
<td>8,456 7,684 6,464</td>
</tr>
<tr>
<td></td>
<td>T 7,212 6,919 6,455</td>
<td>6,732 6,284 5,576</td>
</tr>
<tr>
<td>Model with constant 15% Marginal Tax Rate and Without Self-employment Tax</td>
<td>S 3,112(^#) 2,732 2,221</td>
<td>2,802 2,327 1,689</td>
</tr>
<tr>
<td></td>
<td>T 3,762 3,581 3,339</td>
<td>3,452 3,177 2,807</td>
</tr>
</tbody>
</table>

\(^{a}\) MAC = modified accelerated depreciation.

\(^{b}\) SL = straight-line depreciation.

\(^{c}\) AMAC = alternative modified accelerated depreciation.

\(^{\#}\) The optimal tax strategy for that particular trade or sale option as determined by the maximum net present value ($) of relevant flows.
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