Leasing vs. Buying Farm Machinery

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Machinery and equipment expense typically represents a major cost in agricultural production. Purchasing equipment with the use of personal or business equity and loans from financial institutions or equipment manufacturers has been the typical method of obtaining machinery services for most farm operations. Producers are considering other options for obtaining machinery services due to increasing equipment costs, obsolescence of owned equipment, and limited sources of outside debt capital. These options include leasing equipment, renting equipment, and obtaining machinery services from custom operators (i.e., custom hire).

The Options

Purchase

Purchasing is the traditional method of obtaining machinery or equipment. The farm manager buys a machine using equity or a loan from a dealer or financial institution. Ownership of the machine is transferred to the farm manager, who is responsible for making loan, insurance, tax, and non-warranty repair payments. The owner also provides the labor or hires it and pays for all variable or operating costs such as fuel, lubricants, and routine maintenance. With a purchase, the machinery is set up on a tax depreciation schedule and the owner takes depreciation deductions.

If the machine is financed with a loan, the interest component of a payment is also tax deductible. In addition, the purchaser can expense up to $250,000 of Section 179 property on 2009 federal income tax returns.[1] If this expensing option has not been used by other capital purchases, it can be deducted in the first year of ownership. It can be claimed only during the first year of ownership and the amount claimed with Section 179 is not available for subsequent depreciation. Variable costs such as labor, fuel, and repairs as well as insurance payments are also tax deductible expenses.

Lease

A lease is normally a long-term contract for the use of equipment. These contracts typically last for three to five years. In the case of a lease, the machinery dealer or leasing company essentially provides financing for machinery services to the person leasing the machine, but retains ownership of the machine.

The farm manager leasing the equipment typically is responsible for insurance payments, taxes (if applicable), and repairs not covered by warranty as if the equipment had been purchased. The responsibilities for operating costs, including maintenance, fall on the farm manager just as they would if the machine had been purchased. The manager provides the labor for operating the machinery.

The main differences are that the financing is done with specified lease payments instead of a loan and the title to the equipment remains with the equipment dealer or leasing company. At the end of the lease, the equipment is owned by the equipment dealer and not the farm manager, however, terms often exist that allow the farmer to purchase the equipment at a market value at the end of the lease if they desire to do so. Leases generally cannot be cancelled by the lessee without penalty.

A lease or rental agreement may require a refundable or nonrefundable deposit and will likely call for payments at the beginning of the lease or rental period. In a true lease agreement, the entire lease payment is deductible. A lease deposit also is deductible for producers paying taxes on a cash basis, but the deduction must be amortized (spread over) the life of the lease. However, if the deposit is refundable, the deposit deduction will be subject to recapture on receipt of the refund. Operating costs are also tax deductible. Depreciation and interest deductions are not used.

Rent

This option involves the use of a short-term contract, such as a few days, weeks, or months, for the use of machinery or equipment. The farm manager rents the machinery by the hour, day, week, month, or other arrangement. Renting equipment for specialty

1 *Section 179 deductions have varied considerably. The deduction was $24,000 in 2002 and then increased steadily over the next six years until reaching $250,000 in 2008 and was increased to $500,000 for 2010 and 2011. It is scheduled to be reduced to $25,000 in 2012. Check with a tax advisor regarding the current Section 179 limit and other available tax deductions.*

Table 1. *Present Value of $1,000 Costs Over Five Years Using a Discount Rate of 10 percent.*

Year	Cash Flow	Present Value (Discount) Factor	Present Value (Cost)
1	$1,000	0.909	$909
2	$1,000	0.826	$826
3	$1,000	0.751	$751
4	$1,000	0.683	$683
5	$1,000	0.621	$621
Total	$5,000		$3,709

operations, or operations that are less common, may be a way of avoiding large ownership costs for equipment used infrequently. While the owner of the equipment (i.e., the party renting the machine out) incurs all ownership costs, including market depreciation, interest, insurance, taxes, and major repairs, these costs are passed on to the farm manager via the equipment rental rate. In addition to a rental fee, the farm manager pays for variable expenses such as labor, fuel, oil, and routine maintenance. The rental costs and operating costs are tax deductible.

Custom Hire

This option is also a short-term agreement, but the fees are normally for a specific amount of work to be done. Fees may be based on the number of acres covered or bushels per acre harvested. The custom hire charges are tax deductible. Generally, a custom operator provides the machinery, machine operator, and pays for all ownership and operating costs. Like renting equipment, custom hiring specialty operations, or operations that are less common, may be a way of avoiding large ownership costs for equipment used infrequently.

While farm managers who custom hire equipment operations do not pay variable costs or ownership costs including market depreciation, interest, taxes, insurance, and housing directly, they do pay these costs indirectly. That is, the manager should keep in mind that the costs of operating and maintaining the equipment are paid in one form or another (actual costs are often near or above custom rates[2]). These differences are important to recognize in the analysis of the options.

Evaluating the Options

A method of estimating machinery costs over multiple time periods in current dollars is needed to compare the options of leasing, using custom hire services, renting machinery, or purchasing equipment. To evaluate the various options, Net Present Value (NPV) analysis will be used. This method is desirable because it accounts for the time value of money or opportunity cost of having funds tied up in capital items such as machinery. NPV also can, and should, incorporate the effects of all applicable income tax deductions and market depreciation on the costs of obtaining equipment. The traditional DIRTI (annual depreciation, interest, repairs, taxes, and insurance) formula used to calculate ownership costs for enterprise budgets and partial budgeting is not suitable for comparing the various alternatives because it does not account for either tax depreciation or market depreciation, income taxes, and the timing of cash flows for fixed and variable cost components, which can be different for each option.

Net Present Value (Cost) analysis uses a discounting procedure that converts future annual cash flows into a single current value so that the alternative options can be compared on the basis of a single value. The basic concept of the discounted cash flow (NPV) procedure is that a dollar paid or received today is worth more than a dollar paid or received in the future because today's dollar can be invested to generate earnings.

Therefore, financing arrangements that have different payment requirements at different times must be discounted to a current cost (present value) in order to be appropriately compared. A simple present value (discounting) formula can be expressed as:

$$PVF = 1 \div (1 + i)^n,$$

where:

PVF = present value (discount) factor
i = the discount rate
n = year

The Net Present Value (NPV) is the sum of the annual discounted cash flows, where the discounted cash flow in a particular year is simply the actual cash flow for that year times the corresponding present value (discount) factor for that same year.

2 *Beaton, A.J., K.C. Dhuyvetter, and T.L. Kastens. Custom Rates and the Total Cost to Own and Operate Farm Machinery in Kansas. MF-2583. Available on agmanager.info.*

To illustrate the present value computation or discounting in more detail, consider the example in Table 1. Assume a farm manager has agreed to pay $1,000 per year at the end of each year for the next five years for the use of a retired neighbor's machine shop. The total present value or cost of these services is actually $3,709 at the beginning of year 1 and not $5,000 because in each year the cost of $1,000 is valued less.

The first step in the NPV analysis is to choose the appropriate discount rate to discount the annual cash flows. If the investment is 100 percent financed with debt capital, then the minimum rate of return is the interest rate on the loan since the loan must be repaid. Because farms typically operate with both debt and equity, usually the objective is to evaluate investment alternatives based on the optimal long-run combination of debt and equity. In this case, it is assumed that in the long-run, return on debt and equity is equivalent. That is, little harm is done if machinery decisions are made using a discount rate set equal to the typical interest rate on the machinery loan or farm loans.

The discount rate must also be adjusted to an after-tax rate to account for the impact of interest deduction on after-tax interest costs or taxes on a rate of return used to calculate the discount rate. Thus, an after-tax discount rate is specified as:

$$r = i \times (1 - t),$$

where:

r = after-tax discount rate
i = before-tax discount rate (i.e., interest rate on debt)
t = marginal tax rate (federal, state, and self-employment taxes)

Lease vs. Purchase Example

Details for a combine purchase versus a lease example are shown in Table 2. The combine has an initial purchase price of $317,500, including corn head, and will be used for five years. For purposes of this analysis, it is assumed operating costs (labor, fuel, and repairs) are the same in all cases and insurance and housing costs are the same as well. That is, these costs are the same whether the combine is purchased or leased.

Table 3 shows the annual after-tax cash flows and net present value (cost) for the combine purchase. With a purchase price of $317,500, including a down payment of $63,500, the annual payment for the combine is $61,782. Other fixed and variable costs, including insurance, housing, repairs, labor, and fuel and oil average $17,705 annually, resulting in total cash outlays (before taxes) of $79,487 in Years 1 through 5. However, when income tax deductions are taken into account, the annual after-tax cash flows vary considerably. The most significant income tax impact comes from the optional Section 179 deduction. In Year 1 $125,000 is expensed via Section 179, and when combined with the standard Modified Accelerated Cost Recovery System (MACRS) depreciation deduction, a total of $145,617 of tax depreciation is available. Adding interest and fixed and variable cost deductions create a total tax reduction of $84,637, resulting in a negative after-tax cash flow (cash inflow) in Year 1 of $5,149. The after-tax cash flow increases in Years 2 through 4, but is again a negative $71,244 (cash inflow) in Year 5 as the combine is sold. The net present value (NPV) of the stream of cash flows in Years 0 through 5 for the combine purchase is $138,954.

Table 2. *Combine Purchase and Lease Information*

Purchase Data	
Purchase Price	$317,500
Down Payment	20%
Interest Rate	6.9%
Loan Length	5 years
Annual Payment	$61,782
Salvage Value (in five years)	$162,000
Section 179 Deduction	$125,000
Book Value (in five years)	$58,963
Lease Data	
Lease Length	5 years
Annual Payment	$42,000
Fixed and Variable Costs	
Annual Insurance and Housing[1]	$2,242
Annual Repairs[2]	$2,540
Annual Labor[3]	$4,112
Annual Fuel and Oil[4]	$8,811
Marginal Tax Rate	46.8%
After-Tax Discount Rate	3.67%

[1] *Annual insurance and housing expense is calculated as 1 percent of average market value of machine.*
[2] *Annual repairs based on American Society of Agricultural and Biological Engineers (ASABE) formula that estimates accumulated repairs based on the machine's current list price and accumulated hours of use over the life of the machine.*
[3] *Annual labor expenses are based on annual machine engine hours (267) times 110% times a wage rate of $14 per hour.*
[4] *Annual fuel and oil expenses are based on fuel usage of 15 gallons per hour times the annual machine engine hours (267) times 110% times fuel cost of $2.50 per gallon.*

Table 3. *Net Present Value (Cost) of Combine Purchase*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Down/Loan Payment	Interest portion of Payment	Tax Depreciation	Fixed and Variable Costs	Book Value	Salvage Value	Balancing Charge	Tax Reduction	After-tax Cash Flow	Present Value Factor	PV of After-tax Cash Flow
0	$63,500				$317,500				$63,500	1.0000	$63,500
1	61,782	$17,526	$145,617	$17,705	171,883			$84,637	(5,149)	0.9646	(4,967)
2	61,782	14,472	36,825	17,705	135,058			31,244	47,194	0.9304	43,912
3	61,782	11,208	28,933	17,705	106,125			26,022	52,416	0.8975	47,044
4	61,782	7,718	23,581	17,705	82,544			21,885	56,553	0.8657	48,960
5	61,782	3,988	23,581	17,705	58,963	$162,000	$32,457	(11,269)	(71,244)	0.8351	(59,495)
Total	$372,410	$54,912	$258,537	$88,525		$162,000	$32,457	$152,519	$143,270		$138,954

Factors: depreciation = 7 years, marginal tax rate = 46.8%, self-employment rate = 15.3%, down payment = 20%, loan = 5 years, loan interest rate = 6.9%, after-tax discount rate = 3.67% (6.9 × (1 – 0.468)).

(4) – Tax depreciation equals Section 179 deduction and allowable depreciation based on MACRS schedule
(5) – Total of annual insurance, housing, repairs, labor, and fuel and oil from Table 1.
(6) – Book value is equal to the purchase price less accumulated tax depreciation
(7) – Salvage value is the market value of the machine when sold
(8) – Balancing charge equals depreciation recapture (salvage value - book value) × (tax rate – self employment tax rate) in period machine is sold (8) = [((7) – (6)) × (46.8% - 15.3%)]
(9) – Tax reduction reflects the tax benefit due to eligible deductions [(9) = ((3) + (4) + (5)) × 46.8% – (8)]
(10) – After-tax cash flow equals total payment plus variable costs plus balancing charge minus salvage value minus tax reduction [(10) = (2) + (5) – (7) – (9)]
(11) – Present value (PV) factor is based on discount rate and is calculated as $1 \div (1+ 0.0367)^{Year}$
(12) – Present value of after-tax cash flow reflects discounted cash flow value [(12) = (10) × (11)]

Table 4. *Net Present Value (Cost) of Combine Lease*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	Deposit or Lease Payment	Fixed and Variable Costs	Tax Reduction	After-tax Cash Flow	Present Value Factor	PV of After-tax Cash Flow
0	$42,000			$42,000	1.0000	$42,000
1	42,000	$17,705	$27,942	31,763	0.9646	30,639
2	42,000	17,705	27,942	31,763	0.9304	29,554
3	42,000	17,705	27,942	31,763	0.8975	28,508
4	42,000	17,705	27,942	31,763	0.8657	27,498
5		17,705	27,942	(10,237)	0.8351	(8,549)
Total	$210,000	$88,525	$139,710	$158,815		$149,650

Factors: First lease payment due immediately (no deposit), no buyout at end of lease.
Lease term = 5 years, lease payment = $42,000, no buyout at end of lease.
Marginal tax rate = 46.8%, after-tax discount rate = 3.67% [6.9% × (1 – 46.8%)].

(3) – Total of annual insurance, housing, repairs, labor, and fuel and oil from Table 1.
(4) – Tax Reduction equals lease payment plus variable costs times marginal tax rate (4) = [(2) + (3)] × 46.8%
(5) – After-tax cash flow equals lease payment plus variable costs minus tax reduction [(5) = (2) + (3) – (4)]
(6) – Present value (PV) factor is based on discount rate and is calculated as $1 \div (1 + 0.0367)^{Year}$
(7) – Present value of after-tax cash flow reflects discounted cash flow value [(7) = (5) × (6)]

Table 4 shows the annual after-tax cash flows and net present value for the combine lease. The example combine lease is a five-year lease with annual payments of $42,000. Although there is no deposit required, which is common in many leases, the first payment is made at the inception of the lease (i.e., Year 0). Since the income tax deduction effect of the lease payment will not occur until Year 1, the after-tax cash flow in Year 0 is $42,000. In Years 1 through 4, the after-tax cash flow is $31,763, reflecting the income tax deduction from the lease payment and the associated fixed and variable costs. With no lease payment in Year 5, the after-tax cash flow is ($10,237). The net present value of the stream of cashflows for the lease option in Years 0 through 5 is $149,650.

Based on this example, the purchase would be the preferred option as the NPV is $10,696 less than that of the lease. One of the reasons the purchase has a lower NPV is because of the favorable tax deductions currently available with a purchase. The Section 179 expense deduction option currently allows producers to deduct up to $250,000 of machinery purchases in the year of purchase. As an example of how beneficial the Section 179 deduction is, the advantage of purchasing increases to $20,517 if the full $250,000 deduction were taken and decreases to $875 if no 179 deduction is taken (all else held constant). Thus, this option provides some significant tax advantages, especially in high-income years, however there are some limitations. Most notably, the Section 179 expense cannot create a taxable income loss.

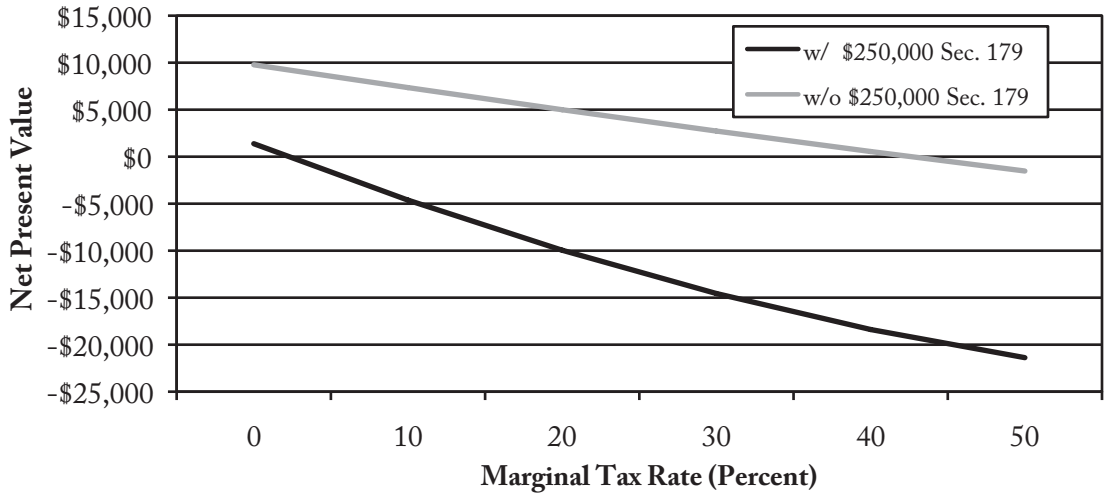
Although the purchase would be the preferred option based on NPV, the lease option has some potential advantages as well. The primary advantage of the lease is the lower before tax annual payment. If a producer does not have the cash flow to make the larger annual payments under the purchase option, a lease may be the best alternative. Similarly, if the amount allowed for a Section 179 deduction would decrease from the current $250,000 limit, or if a producer's tax situation would not allow for the use of the Section 179 deduction, then the lease option may become more attractive.

Figure 1 shows the relative NPV advantage of a lease over a purchase at various marginal tax rates (combined federal, state, and self-employment tax) and with and without the maximum $250,000 Section 179 deduction. Without the Section 179 deduction, the lease has an NPV advantage with marginal tax rates from 0 to 40 percent. At the 50 percent tax rate, the purchase has a $1,500 advantage over the lease. When the maximum Section 179 deduction is taken, the purchase has a significant advantage over the lease at all tax rates except zero percent.

When is a Lease not a Lease?

When a lease is actually a conditional sales contract, it must be treated as a purchase. Depreciation and interest deductions must be used for tax purposes rather than the "lease" payments. The cost of the equipment for depreciation is determined by calculating the present value of lease payments and the

Figure 1. *Net Present Value Advantage of Purchase to Lease**



** Negative values indicate advantage of purchase to lease.*

option price at the end of the lease. This could be to the disadvantage of the purchaser.

The Internal Revenue Service says a lease agreement should be treated as a conditional sales contract if **any** of the following is true (IRS Publication 535, 2010).

1. The agreement applies part of each payment toward an equity interest you will receive.
2. You receive title to the property after you pay a stated amount of required payments.
3. You must pay, over a short period of time, an amount that represents a large part of the price you would pay to buy the property.
4. You pay much more than the current fair rental value of the property.
5. You have an option to buy the property at a small price compared to the value of the property at the time you can exercise the option. Determine this value at the time you enter into the agreement.
6. You have an option to buy the property at a small price compared to the total amount you pay under the lease.
7. The lease designates some part of the payment as interest or part of the payments is easily recognizable as interest.

Rent vs. Custom Hire Example

As previously mentioned, two additional options for acquiring machinery services include renting a machine or hiring a custom operator. Details for a combine rent versus custom hire example are shown in Table 5. In this example, it is assumed that the combine will be rented/custom hired for the next five years, and it will be used to harvest 2,300 acres annually.

The results of the net present value analysis for the combine rental option are shown in Table 6. As with the purchase and lease example, it is assumed

Table 5. *Combine Rent and Custom Hire Information*

Rental Data	
Rental Rate	$190/separator hour
Annual Use (Separator)	200 hours/year
Annual Use (Engine)	267 hours/year
Custom Hire Data	
Base Charge	$25/acre
Acres Harvested	2,300
Variable Costs	
Annual Repairs[1]	$2,540
Annual Labor[2]	$4,112
Annual Fuel and Oil[3]	$8,811
Rent Inflation Rate	3%
Custom Hire Inflation Rate	1%
Rent/Custom Hire Length	5 years
Marginal Tax Rate	46.8%
After-Tax Discount Rate	3.67%

[1] *Annual repairs are based on ASABE formula that estimates accumulated repairs based on the machines current list price and accumulated hours of use over the life of the machine.*

[2] *Annual labor expenses are based on annual machine engine hours (267) times 110% times a wage rate of $14 per hour.*

[3] *Annual fuel and oil expenses are based on fuel usage of 12 gallons per hour times the annual machine engine hours (267) times 110% times fuel cost of $2.50 per gallon.*

Table 6. *Net Present Value (Cost) of Combine Rental Option*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	Rent Payment	Variable Costs	Tax Reduction	After-tax Cash Flow	Present Value Factor	PV of After-tax Cash Flow
0	$38,000			$38,000	1.0000	$38,000
1	39,140	$15,463	$25,021	29,582	0.9646	28,535
2	40,314	15,463	25,554	30,223	0.9304	28,121
3	41,524	15,463	26,104	30,883	0.8975	27,718
4	42,769	15,463	26,670	31,562	0.8657	27,325
5		15,463	27,253	(11,790)	0.8351	(9,846)
Total	$201,747	$77,315	$130,602	$148,460		$139,853

Factors: First rent payment due immediately after use.
Rent term = 5 years, rent payment = $190 per hour (plus 3% inflation per year), 200 hours of use per year.
Marginal tax rate = 46.8%, after-tax discount rate = 3.67% [6.9% × (1 – 46.8%)].

(4) – Tax Reduction equals rent payment plus variable costs times the marginal tax rate (4) = [(2) + (3)] × 46.8%
(5) – After-tax cash flow equals rent payment plus variable costs minus tax reduction (5) = (2) + (3) – (4)
(6) – Present value (PV) factor is based on discount rate and is calculated as $1 \div (1+ 0.0367)^{Year}$
(7) – Present value of after-tax cash flow reflects discounted cash flow value (7) = (5) × (6)

the combine will be rented immediately (i.e., Year 0) and the first payment will occur immediately after use. Also like the lease, the income tax deduction effect of the rental payment will not occur until Year 1, thus the after-tax cash flow in Year 0 is $38,000. In Years 1 through 4, the after-tax cash flow ranges from $29,582 to $31,562. The after-tax cash flow in Year 5 is ($11,790). The net present value of the stream of cash flows in Years 0 through 5 is $139,853.

The results of the net present value analysis for the combine custom hire option (Table 7) are similar to the rent option in terms of timing of payments and income tax consequences. Because repair, labor, and fuel and oil costs are included as part of the custom rate fee, they do not need to be included as part of the custom hire NPV analysis. In addition, custom hire harvesting expenses typically include hauling costs, but were not included in the example in order to isolate and accurately compare combine alternatives. The NPV of the custom hire option, at $149,796, is higher than the rent option, making the rent option the preferred investment.

A summary of the example combine NPV analysis is provided in Table 8. The purchase option had the lowest NPV, meaning that is was the lowest cost alternative over the entire time period and on an annual basis. Although the purchase and rent options were the lowest cost alternatives in this example, the

Table 7. *Net Present Value (Cost) of Combine Custom Hire Option*

(1)	(2)	(3)	(4)	(5)	(6)
Year	Custom Hire Payment	Tax Reduction	After-tax Cash Flow	Present Value Factor	PV of After-tax Cash Flow
0	$57,500		$57,500	1.0000	$57,500
1	58,075	$26,910	31,165	0.9646	30,062
2	58,656	27,179	31,477	0.9304	29,288
3	59,242	27,451	31,791	0.8975	28,533
4	59,835	27,725	32,109	0.8657	27,798
5		28,003	(28,003)	0.8351	(23,385)
Total	$293,308	$137,268	$156,039		$149,796

Factors: First custom hire payment due immediately.
Custom hire term = 5 years, payment = $25 per acre, acres harvested = 2,300,
Inflation rate = 1% per year.
Marginal tax rate = 46.8%, after-tax discount rate = 3.67% [6.9% × (1 – 46.8%)].

(3) – Tax Reduction equals custom rate payment times the marginal tax rate (3) = (2) × 46.8%
(4) – After-tax cash flow equals custom rate payment minus tax reduction (4) = (2) - (3)
(5) – Present value (PV) factor is based on discount rate and is calculated as $1 \div (1+ 0.0367)^{Year}$
(6) – Present value of after-tax cash flow reflects discounted cash flow value (6) = (4) × (5)

Table 8. *Summary of Combine Net Present Value (Cost) Analysis*

Combine Option	Net Present Cost	Annualized Cost
Purchase	$138,954	$30,924
Lease	$149,650	$33,304
Rent	$139,853	$31,124
Custom Hire	$149,796	$33,337

advantage over the other options was relatively small, especially on annualized basis. As the terms of the four options change, the preferred alternative may change as well. For example, it was assumed that in all four cases the quality of the work (i.e., getting crop harvested) was equal and thus not an issue. Although the custom hire option had the highest NPV, it may be the preferred option if labor availability is a concern, or the producers must acquire additional harvest equipment (e.g., heads, grain carts, or trucks). In addition, the rent option may be less appealing if a machine is not available when needed or the producer does not meet the minimum hour requirement that is common in many combine rental agreements.

The previous examples all assumed equal lives (five years) for the different options. However, when unequal lives exist the purchase/lease/rent/custom hire decision must be analyzed by using annual equivalent cash flows. In this case, the NPV of each investment alternative is computed. Then, the amortized value of the NPV is calculated using the following formula:

$$A = NPV \times r(1 + r)^n \div ((1 + r)^n - 1),$$

where:

A = annual equivalent cash flow
NPV = net present value
r = the discount rate
and n = years

Summary

Producers are considering options beyond the traditional method of purchasing equipment for obtaining machinery services. These options include leasing equipment, renting equipment, and obtaining machinery services from custom operators. Each of these options has advantages and disadvantages versus the alternatives. Loan/lease terms, rental/custom hire rates, size of operation, timeliness, and tax considerations are just some of the factors that are important in determining which option is the preferred investment choice. Because no option is always the best alternative, careful consideration and analyses of each alternative must be given

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