No. 1339 Information Sheet August 2001

Should I Lease or Buy?

Steven W. Martin, Fred Cooke, Jr., David Parvin, and Scott Stiles

INTRODUCTION

For many farms, machinery expense is the largest single production expense (Massey). Under current farm financial conditions, producers must search every avenue for opportunities to minimize costs and maximize returns. Producers have three basic options for meeting machinery needs: purchase the needed equipment, lease the needed equipment, or custom hire. Custom hire may work well for certain jobs, but often does not allow the amount of control many operations require. Like purchasing, leasing allows the producer to maintain control of the timeliness and quality of the work conducted on his or her farming operation. Therefore producers should evaluate leasing versus purchasing based on the economic opportunities that each provides.

OVERVIEW OF LEASING

Most leases consist of four basic components:

- Periodic payment
- Length of lease
- Amount of use (hours, miles, etc.)
- Residual

Under a standard lease agreement, the lessee (farmer) agrees to pay the lessor (bank, credit corporation, dealer, etc.) a specified amount (payment) at certain intervals over a certain length of time. Three-year leases with annual payments are very common, but any arrangement is possible. The lease will generally specify the amount of annual use permitted under the base contract. Tractor leases often range from 300 to 1200 hours of annual use. The amount needed to purchase the equipment at the end of the lease is the residual. Any and all of the components are negotiable.

Lease arrangements are based on an initial price for the equipment. As with purchases, producers should negotiate the best deal possible, then consider whether to lease or purchase based on the negotiated price. Just as a lower negotiated price lowers the costs associated with a purchase, a lower negotiated price lowers the costs associated with a lease. Once the initial price has been established, the components of the lease can be finalized.

Producers should select an annual use that fits their farming operation. Often leases will only be available for specific use amounts (such as 200 hours, 300 hours, etc.). The additional charges associated with use beyond that stated in the basic contract will generally be expensive ($30-$40 per hour for row crop tractors). Lessees should evaluate lease contracts for use levels above and below their expected use in order to determine the most economical level.

The length of the lease should be determined by the needs of the individual farmer. Consideration should be given to the length of time the equipment will be needed, the ability or desire to operate machinery past warranty, planned changes in the farming operation (retirement, expansion, etc.), and residual value.

The residual is often the confusing part of a lease. The residual is the amount owed on the equipment at the end of the lease. Generally, the lessee may purchase the equipment for the residual value. The lease will often be designed so the residual is equal to the expected appraised value of the machinery at the end of the lease. The periodic lease payments will reflect the amount of the equipment "used up" during the lease term. Therefore, additional costs associated with excessive wear (hours, miles, etc.) or abuse over and above those designated in the base lease are usually quite expensive. Of course, the residual and the lease payments reflect a lease factor or discount rate. This discount rate may or may not be consistent with the interest rate of a purchase. If the desire is to purchase the equipment after the lease period, then the lessee may try to negotiate a lower residual and higher payments. Depending on an individual's tax situation, this may be an attractive option; however, the IRS will not allow tax credits for leases if "up front" consideration is given to purchasing (IRS). Therefore, producers should consult with their tax adviser prior to entering a lease agreement.

Agricultural producers typically desire annual payments, so the examples given in this document use an annual payment.

Martin is an assistant specialist at the Delta Research and Extension Center (DREC) in Stoneville; Cooke is an agricultural economist at DREC; Parvin is a professor and economist, Department of Agricultural Economics, Mississippi State University; and Stiles is an assistant specialist, University of Arkansas Extension Service. For more information, contact Martin at (662) 686-3264; e-mail SMartin@ext.msstate.edu. This information sheet was published by the Office of Agricultural Communications, a unit of the Division of Agriculture, Forestry, and Veterinary Medicine at Mississippi State University.

Experiment Station
Vance H. Watson, Director
Mississippi Agricultural & Forestry Experiment Station
Malcolm A. Portera, President • Mississippi State University • J. Charles Lee, Vice President

However, just as monthly payments will lower the interest expense of a purchase, monthly lease payments will lower lease expense. Therefore if monthly payments will not upset a producer's cash flow, they should be considered.

Cost Comparison Example

When an asset is leased, the lessee loses the tax benefits of depreciation and interest associated with purchasing. However, the farmer can still deduct the full amount of the lease payment from taxable income as an operating expense. Determining which alternative provides the greater tax benefit is where the decision becomes most complicated. As a precaution, be sure to consult your accountant before signing a lease. There are a variety of leases, and many ways to interpret them for tax purposes.

Most tax benefits associated with leasing and purchasing occur in the future. Therefore, the net cost of each alternative should be analyzed in terms of present dollars. Net present value (NPV) techniques can be used to compare the two options. In other words, the question of whether to lease or borrow can be answered by comparing the present values of the net cash outflows of lease payments and loan payments. In a lease versus purchase decision, the option with the lowest net present value of expense should be chosen. A step-by-step procedure to make a lease/purchase decision follows (Stiles).

1. Determine the present value of the lease.
   a. Obtain the annual lease payments.
   b. Calculate the annual tax benefits of the lease payments.
   c. Subtract (b) from (a) to get the annual cost of the lease after tax.
   d. Multiply (c) by the present value interest factor for each year.
   e. Add up the present values in (d) to get the total present value cost of the lease.
2. Determine the present value of the purchase.
   a. Calculate annual payments for the loan.
   b. Calculate the interest portion of the annual payments.
   c. Calculate the annual depreciation of the asset purchased.
   d. Add (b) and (c) and calculate the tax benefit of these two deductible items.
   e. Subtract the tax benefits (d) from the annual payment on the loan.
   f. Multiply (e) by the present value interest factor for each year.
   g. Add up the figures to get the total present value cost of the purchase.
3. Compare the present value of the lease (from step 1) with the present value of the purchase (from step 2). Select the option with the lowest net present value (remember this is the present value of the cost).

The following example is adapted from an actual lease versus purchase analysis conducted for an Arkansas producer. Almost all leases require the lessee to pay for insurance, taxes, fees, and normal maintenance costs, the same as when equipment is purchased. Therefore, in the following analysis, these items are ignored.

Choosing Between Leasing and Purchasing Example

XYZ Farms is in the highest state and federal tax bracket, in this case, 7 percent for state and 39.6 percent for federal. This operation needs to purchase three-mile center pivots. It employs the Modified Accelerated Cost Recovery System (MACRS) 150 percent declining balance method to compute depreciation (Kay and Edwards). The three (3) pivots cost $125,000 and have a life of seven years. This project can be financed in two ways:

1. Borrow and buy the pivots;
2. Lease the pivots.

Borrow and Buy Alternative

Assume that a bank would require a 25 percent down payment. Thus, $93,750 would be financed for seven (7) years at a fixed interest rate of 8.75 percent.

Because interest is a tax-deductible expense, it is necessary to calculate the yearly interest that accrues on the borrowed money. In this analysis, annual loan payments were calculated both on the basis of equal principal payments and equal payments.

Lease Alternative

The best lease contract that XYZ Farms could negotiate has an annual payment of $20,844 (see Table 1). The annual payment was derived from a lease factor of .16675 provided by the lessor. Also, the term of the lease is seven (7) years with a 10 percent residual or buyout at the end of the lease. The decision now is to select the alternative with the lowest present value cost

Table 1. NPV (in $) of Lease Expenditure – Center Pivot

Year	Tax Payment	Cash Benefit	PVIF Outflows	PV of Cash @ 5%	Outflows
0	20,844		20,844.00	1.000	20,844.00
1	20,844	9,713.30	11,130.70	0.952	10,596.42
2	20,844	9,713.30	11,130.70	0.907	10,095.54
3	20,844	9,713.30	11,130.70	0.864	9,616.92
4	20,844	9,713.30	11,130.70	0.823	9,160.56
5	20,844	9,713.30	11,130.70	0.784	8,726.47
6	20,844	9,713.30	11,130.70	0.746	8,303.50
7	12,500	9,713.30	2,786.70	0.711	1,981.34
Totals	158,408	67,993.10	90,414.88		79,324.75

Summary of Alternatives

Look at the cash outlays for each alternative based on the calculations thus far. Including the down payment in the cash outflows for each loan scenario, total outlay is $157,812 and $160,547 (see column 2, Tables 2 & 3). No loan origination fees are included in this example. This establishes the purchase option with the lowest cash outlay. The lease will have seven (7) payments of $20,844 (Table 1). Typically, the first payment is due at signing, which is assumed in this example. Also, as mentioned earlier, the lease includes a residual ($12,500) which is 10 percent of the entire principal of $125,000. Because center-pivots are used in this discussion, assume that the farmer will pay the residual and thus own the pivot at the end of the lease. Again, paying the residual is optional. If the farmer decided not to pay this, the lessor would retain ownership of the center-pivot. Thus, with the residual payment included, total cash outlay for the lease is $158,408.

Given the analysis, it would seem obvious that the lease would be preferable to a fully amortized loan and only $596 less preferable than a loan with equal principal payments. However, the final decision should be made using the net present value approach.

Net Present Value (NPV) of Lease Payments

The tax benefit of lease payments is given in column 3 of Table 1; it is calculated by multiplying the lease payments in column 2 by the combined 46.6 percent (0.466) tax rate. The cash outflow in column 4 is the lease payment minus the tax benefit. A present value interest factor of 5 percent is used to discount the cash outflows. Note that 5 percent is the after-tax cost of borrowing at 8.75 percent (8.75 % x (1- 0.466) = 5%). The reason for using 5 percent for the after-tax cost of borrowing is that the cash outflows include the tax benefit. To avoid counting the tax benefit twice, cash outflows should always be discounted at an after-tax rate, which in this example is about 5 percent. This method of determining to use 5 percent is debatable, but preferred. In some cases, the current rate of inflation is used. The total present value of the lease option is $79,325.

Table 2. NPV (in $) of Purchase with Equal Principal Payments – Center Pivot (Loan Amount: $93,750)

Year	Loan Pmt.	Interest	Depreciation	Ded. Exps. @ 46.6%	Tax benefit Pmt	Net Loan @ 5%	PV Re-Pmt after Tax	PV of Loan after Tax
0	31,250	0	0	0	0	0	1	31,250.00
1	21,596	8,203	13,393	21,596	10,063.74	11,532.26	0.952	10,978.72
2	20,424	7,031	23,913	30,944	14,419.90	6,004.10	0.907	5,445.72
3	19,252	5,859	18,788	24,647	11,485.50	7,766.50	0.864	6,710.25
4	18,080	4,688	15,313	20,001	9,320.47	8,759.53	0.823	7,209.10
5	16,908	3,516	15,313	18,829	8,774.31	8,133.69	0.784	6,376.81
6	15,737	2,344	15,313	17,657	8,228.16	7,508.84	0.746	5,601.59
7	14,565	1,172	15,313	16,485	7,682.01	6,882.99	0.711	4,893.81
	157,812	32,813	117,346	150,159	69,974.09	56,587.91		**78,466.00**

Table 3. NPV (in $) of Purchase with Equal Payments – Center Pivot (Loan Amount: $93,750)

Year	Loan Pmt.	Interest	Depreciation	Ded. Exps. @ 46.6%	Tax benefit Pmt	Net Loan @ 5% after Tax	PV Re-Pmt	PV of Loan after Tax
0	31,250	0	0	0	0	0	1	31,250.00
1	18,471	8,203	13,393	21,596	10,063.74	8,407.26	0.952	8,003.72
2	18,471	7,305	23,913	31,218	14,547.59	3,923.41	0.907	3,558.53
3	18,471	6,328	18,788	25,116	11,704.06	6,766.94	0.864	5,846.64
4	18,471	5,265	15,313	20,578	9,589.35	8,881.65	0.823	7,309.60
5	18,471	4,109	15,313	19,422	9,050.65	9,420.35	0.784	7,385.55
6	18,471	2,853	15,313	18,166	8,465.36	10,005.64	0.746	7,464.21
7	18,471	1,486	15,313	16,799	7,828.33	10,642.67	0.711	7,566.94
	160,547	35,549	117,346	152,895	71,249.08	58,047.92		**78,385.19**

Net Present Value of Loan Payments

In Tables 2 and 3, column 2 gives the annual loan repayment from which the tax benefit of interest and depreciation should be deducted. The tax benefit, as shown in column 6, is calculated by multiplying the interest and depreciation expenses by the tax rate of 46.6 percent. By subtracting the tax benefit from the annual loan repayment, the loan repayment after tax is shown in column 7. In column 9, the present value of loan repayments has been determined, using the present value interest factor of 5 percent, to obtain a total value of $78,466 for a loan with equal principal payments and $78,385 for a loan with equal payments. As stated earlier, the decision process is:

1. If NPV lease > NPV purchase, borrow and buy the equipment.
2. If NPV lease < NPV purchase, lease the equipment.

Because the present value of the purchase expenditure $78,466 or $78,385 is lower than $79,325 (lease), the purchase option is more economical. XYZ Farms could save as much as $940 in current dollars by purchasing rather than leasing the pivots ($79,325-$78,385=$940).

Obviously, $940 is not a significant savings for this level of investment. However, this analysis has exposed some points for consideration. For example, it is easy to say that the cash expense of the lease option is $2,139 less than a fully amortized loan ($160,547-$158,408 = $2,139, Column 2 in Tables 1 & 3). One could also say it would be $596 less expensive to structure a loan with equal principal payments ($158,408-$157,812 = $596). However, simply looking at the cash outlay for each alternative is only scratching the surface. Consideration must be given to the tax benefits of both leasing and purchasing. In the example, purchasing proved to be the best choice over leasing, no matter how the loan payments were structured.

Equipment Example

Tables 4 and 5 contain similar information for a tractor/equipment comparison. The analysis is based on an equipment cost of $100,000. For the purchase analysis in table 4, a 25 percent ($25,000) down payment requirement is assumed. The balance ($75,000) is financed over a 7-year period at 7.5 percent interest (7.5% was available through one equipment dealer at the time of this writing). Table 4 shows the annual payments broken down into principal and interest payments for tax purposes. Depreciation was calculated using the MACRS method. The $14052.68 shown as tax adjusted cash flow of the residual and salvage was calculated as per Edwards, Klinefelter and McCorkle and serves to adjust the purchase option to the same contract period as the lease option.

After tax cash flow is discounted at a 5 percent inflation rate for both the purchase and the lease. A 33 percent tax rate is used for both options as well.

The annual lease payments shown in table 5 were calculated using a lease factor (.3577) available from a manufacturer at the time of this writing. A residual value of 70 percent, consistent with 600 hours' annual use, was used. As in the center pivot example, the lowest cash outlay will be the most economical choice. In this case, the lease is slightly better ($140.70).

Table 6 shows per hour fixed costs on selected equipment. The fixed costs per hour for the purchase are based on the 2000 Mississippi State Planning Budgets (MSPB). The fixed costs per hour for the lease were obtained from various equipment dealers. Often these comparisons are all that are considered. However, the NPV methods and the tax advantages that have been illustrated should be used to compare fixed costs per hour.

Table 4. NPV (in $) Tractor Purchase Option

	Year 0	Year 1	Year 2	Year 3	Tax adjusted cash flow of residual and salvage value	NPV of the Lease
Principal payment	-25000	-8535	-9175	-9863		
Interest Payment		-5625	-4985	-4297		
Depreciation		-10714	-19133	-15033		
Tax deductible expenses (depreciation and interest expense)		16339	24118	19330		
Tax savings (such as tax deductions multiplied by tax rate; in this scenario tax rate is 33%)		5391.87	7958.94	6378.90		
After Tax Cash Flow	-25000	-8768.13	-6201.06	-7781.10		
After Tax Cash Flow discounted for a 5% inflation rate	-25000	-8350.77	-5624.36	-6190.64	14052.68	
NPV of the Lease (sum of the after tax cash flows adjusted for inflation)						**-31113.10**

Table 5. NPV (in $) Tractor Lease Option

	Year 0	Year 1	Year 2	Year 3	NPV of the Lease
Lease payments	-15617	-15617.00	-15617.00		
Tax savings		5153.61	5153.61	5153.61	
After tax cash flow	-15617	-10463.40	-10463.40	5153.61	
Discounted after tax cash flow	-15617	- 9965.33	- 9490.29	4100.21	
NPV of the lease					**-30,972.40**

Table 6. Fixed Cost (in $) per Hour Selected Equipment

Type Equipment	Lease/Fixed Cost per Hour	Purchase/Fixed Cost per Hour
Tractor 90 hp	11.67	10.63
Tractor 150 hp	15.00	15.74
Tractor 170 hp	20.00	16.82
Tractor 220 hp	25.00	24.91
Hi boy 60ft	37.14	29.22
Hi Boy 90ft	40.00	39.50
Cotton Picker 4-row	125.00	145.38
Cotton Picker 6-row	165.00	173.91

CONCLUSION

It is extremely important to gather all the necessary information to determine which option is best. Depending on the lessee's financial situation, the lower "up-front" costs might make the lease more attractive. A different depreciation method might have changed either outcome. Different tax rates, loan repayment periods, down payment requirements and lease factors all deliver different results. As with any economic analysis spanning several years, results are very sensitive to interest rate changes. These are but two of many scenarios that could be used as examples. Leases are also available for farm building construction.

This bulletin should be used only as a guide for producers evaluating lease versus purchase decisions. Because of the tax benefits or lack thereof, you should contact your tax adviser before making any lease/purchase decisions. Additionally, be sure that all benefits and costs are evaluated using an NPV approach.

Note: The University of Missouri has an "Equipment Lease Analyzer" available for downloading at: http://agebb.missouri.edu/download/unversity/equipment.exe.

REFERENCES

Edwards, Richard, Danny Klinefelter and Dean McCorkle. Leasing vs. Buying Farm Machinery. Texas Agricultural Extension Service. Publication L-5273 RM5-4.0 5-99. Available on the Web at http://agpublications.tamu.edu.

Internal Revenue Service. Farmer's Tax Guide. Available on the Web at http://www.irs.gov.

Kay, Ronald D. and William M. Edwards. Farm Management, Third Edition. McGraw-Hill, Inc. 1994.

Massey, Ray. Leasing Farm Equipment. Department of Agricultural Economics and Commercial Agriculture Program, University of Missouri. Publication GOO429. Available on the Web at http://muextension.missouri.edu/xplor/agguides/agecon/g00429.htm.

Stiles, Scott. Leasing or Buy Decisions Demand Close Examination. University of Arkansas Extension Service. Available on the Web at http://www.aragriculture.org/News/farmmgmt/2000/HTML/march2000.asp#Lease.

ACKNOWLEDGMENTS

Additionally, the authors would like to thank the equipment dealers and representatives (Eugene Tarsi and Chip Otts of West Implement, and John Ray of Ayres Implement) who provided invaluable assistance.

Mississippi State University

Printed on Recycled Paper