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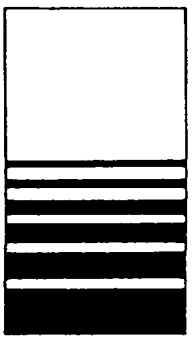

BUSINESS
MANAGEMENT
IN AGRICULTURE

A joint project of the
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Farm machinery and equipment: Buy, lease, or custom hire?

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Farm machinery and equipment: buy, lease or custom hire?

David A. Lins

Dave Lins was born and raised on a dairy/hog farm in south central Wisconsin. He received B.S. and M.S. degrees in agricultural economics from the University of Wisconsin, and a Ph.D. in agricultural economics from the University of Illinois. Prior to joining the University of Illinois in 1982 as a professor of farm financial management, he was an agricultural economist with the Economic Research Service, U.S. Department of Agriculture. At the University of Illinois he teaches both graduate and undergraduate classes in agricultural finance and farm management. Lins is the coauthor of four books and numerous articles in journals and trade magazines. In addition to his university activities, Dave is a partner in the consulting firm Agricultural Education and Consulting (AEC).

Purpose

The purpose of this module is to help you:

1. deal with questions like:
   "Can I afford new equipment?"
   "Should I replace now or later?"
   "If I do replace now, what is the least-cost option?"
   "Should I buy or rent?"
   "Where can I get the best deal?"
2. become acquainted with four alternative ways of obtaining machinery and equipment for your farm;
3. learn the advantages and disadvantages of each as a least-cost alternative to fit your operation and financial situation;
4. become aware that machinery costs have three components: ownership, operating and intangible costs;
5. learn three different methods or criteria for evaluating each alternative in terms of those three costs;
6. learn about net present value and practice using it as a tool for making your final machinery investment decisions; and
7. confidently make machinery and equipment investment decisions based on business principles rather than impulse or emotion.

This is one module of the *Business Management in Agriculture* series and is intended to be used with its corresponding videotape. The script may vary from the actual videotape text.

Videotape script

By David A. Lins

Another trip to town for parts! This old tractor has seen better days. Sure hope the weather holds long enough to get finished. Boy, when I get my new tractor life sure will be a lot easier!

Buying new machinery is often a major investment decision. Before you acquire machinery, several questions likely come to mind. Questions like: Can I afford new equipment? Should I buy or rent? Where can I get the best deal? This module will help you evaluate the options available for acquiring the machinery and equipment you need for your business.

Four options for obtaining the use of machinery and equipment are: purchase, operating lease, financial lease and custom hire.

Purchase of machinery and equipment is one alternative. When you purchase machinery, you become the owner and are responsible for all costs of operating and maintaining the equipment. As the owner, you can deduct operating costs, interest on borrowed funds, property taxes and depreciation when computing your taxes.

An **operating lease** offers an alternative for acquiring the use of machinery without owning it. An operating lease is usually a short-term rental arrangement. The rental charge is usually based on units of work such as dollars per acre or dollars per hour. The leasing company owns the machinery and usually pays for all repairs and maintenance. The farmer leasing the equipment usually pays for fuel and provides all labor. For tax purposes you can deduct the cost of leasing equipment, but you cannot deduct depreciation expenses since you do not own the equipment.

Operating leases are common on general purpose items, such as tractors, which are used many times during the year. Seasonal operating leases for tractors and combines are quite common. In some areas, short-term leases are available only on excess inventory. Thus machinery availability may be an added risk for these agreements.

A **financial lease** is a long-term contract, usually for the useful life of the machinery. The farmer has exclusive rights to use the equipment or machinery. Because the lease is a long-term agreement, it may be costly to prematurely terminate the lease agreement. A financial lease is quite similar to an outright purchase. Under a financial lease, the farmer pays all repair, maintenance and operation

OPTIONS FOR MACHINERY AND EQUIPMENT

- Purchase
- Operating lease
- Financial lease
- Custom hire

OPTIONS AT END OF LEASE INCLUDE:

- Purchase for amount specified in contract
- Purchase at market value
- Renew lease
- Return equipment

costs. Options at the end of the lease period can include:

1. purchase of the asset for an amount specified at the time the lease is signed,
2. purchase at fair market value,
3. renew the lease or
4. return the equipment to the lessor.

Prior to passage of the 1986 Tax Reform Act, some equipment manufacturers and lenders found it profitable to enter into financial lease contracts with farmers. These institutions were often in a higher tax bracket and could gain a better tax advantage from investment credit and depreciation deductions than could farmers in low tax brackets. Thus a considerable amount of financial leasing of farm machinery and equipment was tax motivated. It appears the Tax Reform Act of 1986 will reduce the tax incentives for financial leasing of farm assets. The loss of investment tax credit, longer depreciation schedules and fewer tax credits will likely reduce the tax incentives for financial leasing.

Custom hiring is similar to an operating lease, except the custom operator also provides the labor to run the equipment. Common examples include custom combining; custom application of fertilizer, lime, and chemicals; and custom feeding of livestock.

Custom hiring can be a good choice when you need high-cost and/or specialized machinery and equipment for a short time. By offering their services to other farmers, custom operators can spread the cost of the machinery and equipment over many acres. For example, some custom combine operators start in Texas and follow the wheat harvest north to Canada. Custom hiring is also attractive when labor is scarce.

In some areas it is possible for landowners to custom hire the entire operation from tillage and planting to harvest and delivery. Farmers with excess machinery capacity and labor can do custom work to stay fully employed and to keep their machinery running.

CUSTOM HIRE CAN INCLUDE:

- Combining
- Application of fertilizer, lime, and chemicals
- Livestock feeding

Which option is best?

Which alternative—purchase, operating lease, financial lease or custom hiring is best? Three criteria can be used to evaluate alternatives: cash flow feasibility, capital debt repayment capacity and costs and returns.

Cash flow feasibility analysis will tell you whether or not the farming operation will generate enough cash to meet the payments required by the various machine acquisition strategies. For example, it may be profitable to purchase a new combine, but if the purchase requires 100 percent cash it may not be feasible from a cash flow

perspective. In this case, a lower profit alternative, say custom hiring, may be much more feasible from a cash flow perspective.

Capital debt repayment capacity measures the ability of the farm to generate enough profit (but not necessarily cash) to meet payments on capital purchases. A more detailed description of capital debt repayment capacity is contained in the module entitled "Obtaining and using credit effectively" by Dr. David Kohl.

The third criteria for making decisions is **costs and returns**. Regarding costs, think of machinery costs as having three components: ownership costs, operating costs and intangible costs.

Cost components

Ownership costs include depreciation, interest on your investment, insurance, property taxes if applicable, and housing or storage costs. The tax code specifies depreciation charges allowed for farm machinery and equipment. The 1986 Tax Reform Act increased the length of the depreciation schedule for most farm machinery and thereby spreads the depreciation expense over more years.

Some farmers don't think of interest as a cost unless they borrow money to buy machinery. But even when you don't borrow money, interest charges should be considered because your capital could be invested and earn an income. If you include interest charges in your comparison of purchase and nonpurchase alternatives, your figures will be more meaningful.

Operating costs are directly related to how much you use your machinery and equipment. Operating costs include fuel and lubrication, repairs, and labor costs. Some farmers don't think of their own labor as a cost; however, the value of your labor must be considered to accurately compare custom hiring to other alternatives which require your own labor.

Intangible costs, by their very nature, are hard to estimate. Intangible costs include such things as reliability, timeliness and pride of ownership. For example, a common concern with custom combining is timeliness of operation. The ideal harvest time may pass before custom operators are available. Even though ownership may be more expensive, the operator may believe that a timely harvest will offset the additional costs of ownership.

There is no precise method for estimating intangible costs. The farmer's subjective judgment plays a key role in the decision process. Even though it's difficult to measure intangible costs, don't let that be an easy excuse. Intangible costs are important in comparing machinery alternatives.

MACHINERY COST COMPONENTS

Ownership costs
- Depreciation
- Interest
- Insurance
- Property taxes
- Housing/storage costs

Operating costs
- Fuel and lubrication
- Repairs
- Labor costs

Intangible costs
- Reliability
- Timeliness
- Pride of ownership

NET PRESENT VALUE

Rule for accuracy of comparison:

- Measure cash flows on **after-tax** basis
- Use **after-tax** discount rates

Now that we have identified the various cost components of machinery, how can we compare the differences in costs among alternatives?

Comparing cost differences

Net present value calculations are an effective way of evaluating investment alternatives. To figure a net present value, take all cash inflows and all cash outflows occurring over time and discount them back to the present. That allows you to express in today's dollars the value of money which is to be received or spent in the future.

A brief example may help explain the concept of net present value. Suppose you expect to receive $1,000 at the end of each of the next three years. That means you will have received a total of $3,000 by the end of three years. What is the value today of that stream of income? Because of inflation, a dollar received in the future is not likely to be worth as much as a dollar today. Likewise, money received today could be invested and earn interest. You can express the value of future dollars in today's dollars by "discounting" future cash flows back to the present.

End of year	Cash received	Discount factor @ 10%	Net present value
1	$ 1,000	.909	909.00
2	1,000	.826	826.00
3	1,000	.751	751.00
Net present value			$ 2,486.00

Using a 10-percent discount rate, the net present value of the cash flows is found to be $2,486, or considerably less than the $3,000 to be received over the three-year period. Stated another way, we could have invested $2,486 at the start of year one in an account paying 10-percent interest. Then, at the end of each of the next three years, we would have had enough cash to withdraw $1,000 per year.

The discount rate is chosen to reflect the return that could be achieved in the next-best investment alternative. Discount factors can be found in most financial textbooks, by using financial calculators, or with available computer software. Appendix Table 1 (pp. 13-14) contains a set of discount factors.

An important point to keep in mind when you calculate a net present value is: measure cash flows on an after-tax basis and use an after-tax discount rate. This procedure will insure proper treatment of tax differences among investment alternatives.

An example

Now let's try to apply all of this with the use of an example. Suppose you need machinery and have the following three options. First, you can buy the machinery for $70,000 cash. Secondly, the local lender will finance the purchase with 25-percent down, the remainder to be repaid in three equal annual payments of $21,111. The interest rate is 10 percent. And finally, the machinery can be acquired on a financial lease with prepaid annual lease payments of $11,800 for eight years. At the end of that time you plan to return the machine to the lessor.

Assume the machinery is depreciated over seven years and that you are in a 28-percent tax bracket. Further, assume the machinery has a salvage value of $7,000.

Take time now to study Appendix Tables 1 and 2. Table 1 (pp. 13-14) shows discount factors. Table 2 (p.15) shows the net cash flows for the three machinery options: cash purchase, credit purchase and financial lease. Carefully study the net cash flows for each alternative.

Now that you've had a chance to review Appendix Table 2, let's consider the three options more carefully. In reviewing Table 2, we see the amount of cash required up front for the three options is as follows:

Option 1:	cash purchase	$ 70,000
Option 2:	credit purchase	17,500
Option 3:	financial lease	11,800

From a cash flow perspective, the financial lease appears to be the most attractive the first year. But cash payments under the lease last for eight years.

Total net cash outflows after taxes over the life of the investment are as follows:

Total net cash outflow	
Cash purchase	$ 45,360
Credit purchase	53,160
Financial lease	67,968

If you compare the alternatives on this basis alone, the cash purchase looks much better than the credit purchase or the financial lease. But a comparison of total cash outflows is not appropriate. Why is this true? Remember that cash outflows under each of the three alternatives differed greatly in terms of timing. To adjust for these differences in timing, we must calculate a net present value. That process discounts all future cash flows back to the present. Only then can we compare all three alternatives in terms of today's dollars.

Calculating net present value

Using a discount rate of 10 percent, let's figure the net present value of the cash purchase. Below we see the net cash outflows for each period, multiplied by a discount factor from Appendix Table 1. These values are summed to arrive at a net present value.

Year	Net cash outflow	Discount factor @ 10%	Net present value
0	$ 70,000	1.000	70,000
1	– 2,800	.909	– 2,545
2	– 4,800	.826	– 3,967
3	– 3,429	.751	– 2,576
4	– 2,449	.683	– 1,673
5	– 1,749	.621	– 1,086
6	– 1,749	.564	– 987
7	– 1,749	.513	– 898
8	– 5,915	.467	– 2,762
Total	$ 45,360		$ 53,506

The net present value of all cash outflows is $53,506. That value can be compared to the net present value for the other two options—credit purchase and financial lease.

Stop at this point and do Exercise 2. This will give you experience in calculating the net present value for the other two options.

You should now be more comfortable calculating net present values. In Exercise 2, which option did you find most attractive? You should have found that the credit purchase had the lowest net present value of cash outflows (50,905) and is therefore the preferred option.

You've probably gathered that the discount rate you use to calculate net present value has an important bearing on the outcome. Here's a table that shows the effect of different discount rates.

Net present value of cash outflows using various discount rates

Discount rate	Cash purchase	Credit purchase	Financial lease
0	45,360	53,160	67,968
5	50,081	52,277	58,725
10	53,506	50,905	51,607
15	56,064	49,358	46,067

Notice that at a discount rate of 0 or 5 percent, the cash purchase option has the lowest net present value of cash outflows and is therefore the preferred alternative. In the sample above, our after-tax cost of borrowing money is 7.2 percent. When the discount rate is less than the after-tax cost of borrowing, a cash purchase will give a lower net present value of cash outflows than a credit purchase. When the discount rate is above the after-tax cost of borrowing the credit purchase is better than the cash purchase.

At a discount rate of 10 percent, the credit purchase is best, while at a 15-percent discount rate the financial lease alternative is best. Remember, these outcomes are specific to our example. Your individual alternatives may give you a different outcome. Figuring net present values can help you sort out your alternatives.

Adjusting for tax brackets

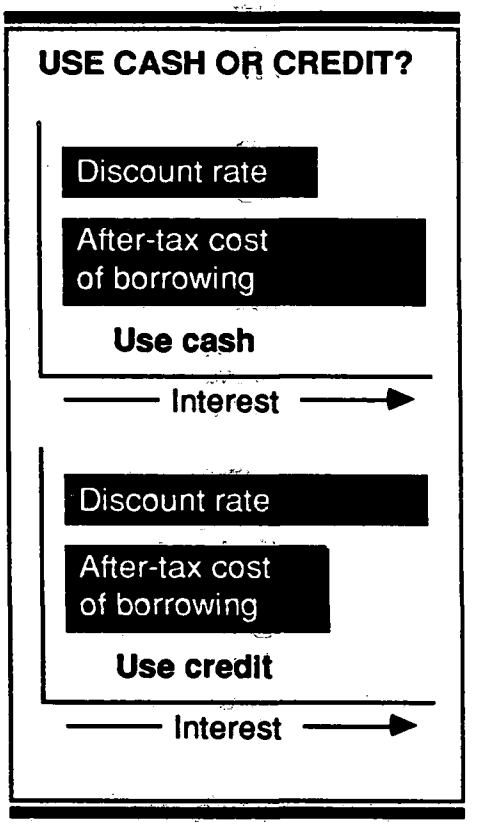
The tax bracket you fall into also influences your net present value figures. Let's return to our previous example where we used a 10-percent discount rate. The net present value of the cash outflows under three tax brackets (0, 15, 28) are shown here. Remember, as we change tax brackets we also need to change our discount rate since that rate reflects an after-tax return.

As the following table shows, if you have no taxable income, the lease alternative is preferred. However, as your tax rate rises and the discount rate falls, the credit-financed purchase becomes more attractive relative to the lease.

Net present value of cash outflows using various tax rates

Marginal tax rate	Discount rate	Cash purchase	Credit purchase	Financial lease
0	13.90	67,529	64,125	62,558
15	11.76	60,356	57,421	57,198
28	10.00	53,506	50,905	51,607

Remember our earlier discussion of ownership, operating and intangible costs? In the example just completed, we examined ownership costs, but not operating or intangible costs. We could ignore operating costs because whether we purchase with cash or credit, or lease the equipment, operating costs would be identical. Intangible costs would differ, however, if you take pride in owning machinery rather than leasing it. Many farmers would



rather own than lease. Think about your own preferences when you make machinery investment decisions.

Operating costs

So far we have examined machinery ownership costs. Now let's look at another example which requires us to consider operating costs as well. Suppose you are considering two alternatives: custom hiring versus purchasing equipment on credit. For simplicity, we're going to assume that the purchase alternative is identical to our previous example. A comparison of annual operating costs for the two alternatives follows. For simplicity, the example assumes no increases over time in operating costs or custom-hire rates.

	Custom hire	Credit purchase
Acres to be farmed	500	500
Total custom hire charge	$ 37,000	N.A.
Hours of operator labor/acre	N.A.	4
Total value of operator's time	N.A.	$ 10,000
Fuel, oil, repairs and other operating costs	N.A.	$ 10,000
Total operating costs	$ 37,000	$ 20,000

Notice the custom-hire alternative has total operating costs which are $17,000 per year higher than if you purchase the equipment on credit. However, you have no ownership costs when you custom hire.

Now let's compare the custom-hire and credit-purchase alternatives by calculating net present value for each. Appendix Table 3 (p. 16) describes the net after-tax cash flows for these two alternatives. Take time now to become more familiar with the two options before we move on to calculating a net present value for each.

Putting it all together

Now that you've had a chance to review Appendix Table 3, let's consider the two options in more detail.

Total cash outflows after taxes over the life of the investment are:

Credit purchase	$ 190,757
Custom hire	$ 213,120

If you compared the investments on this basis alone, the credit purchase looks better than custom hiring. This comparison, however, doesn't account for the time value of money. Figuring net present value allows us to compare these investments in terms of today's dollars. The follow-

ing shows the net present value of each alternative for various discount rates. We did not change the marginal tax rate as we changed discount rates, therefore, these figures should be viewed as the outcomes for different farm operators.

Net present value of cash outflows using various discount rates

Discount rate	Credit purchase	Custom hire
0	$191,199	$ 213,120
5	164,418	172,180
10	143,352	142,122
15	127,010	119,542

Notice that at low discount rates, the credit purchase alternative is better. At high discount rates the custom-hire alternative is better. In this example, we assumed no difference in the timeliness of operations between credit purchase and custom hire. If the credit purchase allows for more timely operations, we need to adjust our calculations for that difference.

In our example so far, we have assumed that the operator could earn $5.00 per hour with 2,000 hours of labor freed by custom hiring. What would happen if we changed that hourly rate? Here we show how net present values change as we adjust the value of operator labor.

Net present value of cash outflows: credit purchase versus custom hire using alternative wage rates

Value of operator labor/hour	Credit purchase	Custom hire
$ 0.00	$ 90,003	$ 142,122
3.35	125,747	142,122
5.00	143,352	142,122
10.00	196,702	142,122

If this operator has no alternative use of labor, or can make only $3.35 per hour, then the credit purchase is the best deal. However, if the operator can make more than $5.00 per hour, then custom hiring is better.

Throughout our discussion we have looked only at the cost side of machinery-investment decisions. Net present value calculations allow you to choose the least-cost method of acquiring the use of farm machinery. But

RULE OF THUMB

Replace machinery or equipment when annual cost of old machinery exceeds annual cost of new machinery.

finding the least-cost alternatives do not help you decide whether or not you need new machinery in the first place.

Of course, most farm operators already have machinery and equipment. Often their decision is twofold: Should I replace now or later? And if I do replace now, what is the least-cost alternative?

We can't cover replacement decisions in this session, but you should focus on economic criteria when you make such replacement decisions. The best time to replace machinery or equipment is when the annual cost of the old machinery (repairs, operation, delay costs, etc.) exceed the annual cost of new machinery. You need detailed records and engineering studies to determine annual costs. Farmers, however, often make replacement decisions based more on tax considerations and cash availability.

In this module, we have shown how to use net present value calculations to make machinery decisions. Many computer software packages are available to reduce the number crunching. Check with your local Extension office for more information.

This concludes our discussion on analyzing buy, lease or custom-hire alternatives. Making decisions on major capital purchases is usually not easy, but sound economic analysis can help avoid costly mistakes.

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Appendix table 1

Interest factors for discounting a single amount*

	0.5%	0.75%	1%	1.5%	2%	2.5%	3%	4%	5%
n									
1	0.995	0.993	0.990	0.985	0.980	0.976	0.971	0.962	0.952
2	0.990	0.985	0.980	0.971	0.961	0.952	0.943	0.925	0.907
3	0.985	0.978	0.971	0.956	0.942	0.929	0.915	0.889	0.864
4	0.980	0.971	0.961	0.942	0.924	0.906	0.808	0.855	0.823
5	0.975	0.963	0.951	0.928	0.906	0.884	0.863	0.822	0.784
6	0.971	0.956	0.942	0.915	0.888	0.862	0.837	0.790	0.746
7	0.966	0.949	0.933	0.901	0.871	0.841	0.813	0.760	0.711
8	0.961	0.942	0.923	0.888	0.853	0.821	0.789	0.731	0.677
9	0.956	0.935	0.914	0.875	0.837	0.801	0.766	0.703	0.645
10	0.951	0.928	0.905	0.862	0.820	0.781	0.744	0.676	0.614
11	0.947	0.921	0.896	0.849	0.804	0.762	0.722	0.650	0.585
12	0.942	0.914	0.887	0.836	0.788	0.744	0.701	0.625	0.557
13	0.937	0.907	0.879	0.824	0.773	0.725	0.681	0.601	0.530
14	0.933	0.901	0.870	0.812	0.758	0.708	0.661	0.577	0.505
15	0.928	0.894	0.861	0.800	0.743	0.690	0.642	0.555	0.481
16	0.923	0.887	0.853	0.788	0.728	0.674	0.623	0.534	0.458
17	0.919	0.881	0.844	0.776	0.714	0.657	0.605	0.513	0.436
18	0.914	0.874	0.836	0.765	0.700	0.641	0.587	0.494	0.416
19	0.910	0.868	0.828	0.754	0.686	0.626	0.570	0.475	0.396
20	0.905	0.861	0.820	0.742	0.673	0.610	0.554	0.456	0.377
24	0.887	0.836	0.788	0.700	0.622	0.553	0.492	0.390	0.310
28	0.870	0.811	0.757	0.659	0.574	0.501	0.437	0.333	0.255
30	0.861	0.799	0.742	0.640	0.552	0.477	0.412	0.308	0.231
32	0.853	0.787	0.727	0.621	0.531	0.454	0.388	0.285	0.210
36	0.836	0.764	0.699	0.585	0.490	0.411	0.345	0.244	0.173
48	0.787	0.699	0.620	0.489	0.387	0.306	0.242	0.152	0.096
60	0.741	0.639	0.550	0.409	0.305	0.227	0.170	0.095	0.054

* $\frac{1}{(1+i)^n}$

Interest factors for discounting a single amount (cont.)

n	6%	7%	8%	9%	10%	12%	14%	16%	20%	25%
1	0.942	0.935	0.926	0.917	0.909	0.893	0.877	0.862	0.833	0.800
2	0.890	0.873	0.857	0.842	0.826	0.797	0.769	0.743	0.694	0.640
3	0.840	0.816	0.794	0.772	0.751	0.712	0.675	0.641	0.579	0.512
4	0.792	0.763	0.735	0.708	0.683	0.636	0.592	0.552	0.482	0.410
5	0.747	0.713	0.681	0.650	0.621	0.567	0.519	0.476	0.402	0.328
6	0.705	0.666	0.630	0.596	0.564	0.507	0.456	0.410	0.335	0.262
7	0.665	0.623	0.583	0.547	0.513	0.452	0.400	0.354	0.279	0.210
8	0.627	0.582	0.540	0.502	0.467	0.404	0.351	0.305	0.233	0.168
9	0.592	0.544	0.500	0.460	0.424	0.361	0.308	0.263	0.194	0.134
10	0.558	0.508	0.463	0.422	0.386	0.322	0.270	0.227	0.162	0.107
11	0.527	0.475	0.429	0.388	0.350	0.287	0.237	0.195	0.135	0.086
12	0.497	0.444	0.397	0.356	0.319	0.257	0.208	0.168	0.112	0.069
13	0.469	0.415	0.368	0.326	0.290	0.229	0.182	0.145	0.093	0.055
14	0.442	0.388	0.340	0.299	0.263	0.205	0.160	0.125	0.078	0.044
15	0.417	0.362	0.315	0.275	0.239	0.183	0.140	0.108	0.065	0.035
16	0.394	0.339	0.292	0.252	0.218	0.163	0.123	0.093	0.054	0.028
17	0.371	0.317	0.270	0.231	0.198	0.146	0.108	0.080	0.045	0.023
18	0.350	0.296	0.250	0.212	0.180	0.130	0.095	0.069	0.038	0.018
19	0.331	0.277	0.232	0.194	0.164	0.116	0.083	0.060	0.031	0.014
20	0.312	0.258	0.215	0.178	0.149	0.104	0.073	0.051	0.026	0.012
24	0.247	0.197	0.158	0.126	0.102	0.066	0.043	0.028	0.013	0.005
28	0.196	0.150	0.116	0.090	0.069	0.042	0.026	0.016	0.006	0.002
30	0.174	0.131	0.099	0.075	0.057	0.033	0.020	0.012	0.004	0.001
32	0.155	0.115	0.085	0.063	0.047	0.027	0.015	0.009	0.003	0.001
36	0.123	0.088	0.063	0.045	0.032	0.017	0.009	0.005	0.001	0.000
48	0.061	0.039	0.025	0.016	0.010	0.004	0.002	0.001	0.000	0.000
60	0.030	0.017	0.010	0.006	0.003	0.001	0.000	0.000	0.000	0.000

Appendix table 2

Net cash outflows: cash purchase, credit purchase and financial leasing of machinery[1]

CASH PURCHASE

End of year	(a) Purchase cost	(b) Salvage value	(c) Depreciation[2]	(d) Tax savings (b+c)•(–0.28)	(e) Net cash outflows (a+b+d)
0	70,000				70,000
1			10,000	–2,800	–2,800
2			17,143	–4,800	–4,800
3			12,245	–3,429	–3,429
4			8,746	–2,449	–2,449
5			6,247	–1,749	–1,749
6			6,247	–1,749	–1,749
7			6,247	–1,749	–1,749
8		–7,000	3,125	1,085	–5,915
TOTAL					$45,360

CREDIT PURCHASE

End of year	(f) Down pymt & loan pymts	(g) Interest	(h) Tax saving (b+c+g)•(–0.28)	(i) Net cash outflows (b+f+h)
0	17,500			17,500
1	21,111	5,250	–4,270	16,841
2	21,111	3,664	–5,826	15,285
3	21,111	1,919	–3,966	17,145
4			–2,449	–2,449
5			–1,749	–1,749
6			–1,749	–1,749
7			–1,749	–1,749
8			1,085	–5,915
TOTAL				$53,160

FINANCIAL LEASE

End of year	(j) Lease payments	(k) Tax savings[2] (j)•(–0.28)	(l) Net cash outflows (j+k)
0	11,800		11,800
1	11,800	–3,304	8,496
2	11,800	–3,304	8,496
3	11,800	–3,304	8,496
4	11,800	–3,304	8,496
5	11,800	–3,304	8,496
6	11,800	–3,304	8,496
7	11,800	–3,304	8,496
8	0	–3,304	–3,304
TOTAL			$67,968

[1] Negative signs imply a cash inflow rather than a cash outflow.

[2] Depreciation is based upon the Modified Accelerated Cost Recovery System (MACRS) as defined in the 1986 Tax Reform Act. Refer to the *Farmers Tax Guide* for additional information and details.

Appendix table 3

Net after-tax cash outflows: credit purchase vs. custom hire alternatives[1]

CREDIT PURCHASE

End of year	(a) Down pymt & loan pymts	(b) Interest expense	(c) Operating expenses	(d) Depreciation[2]	(e) Value of operator labor	(f) Salvage value	(g) Tax savings (b+c+d+f) •(–0.28)	(h) Net cash outflows (a+c+e+f+g)
0	17,500							17,500
1	21,111	5,250	10,000	10,000	10,000		– 7,070	34,041
2	21,111	3,664	10,000	17,143	10,000		– 8,626	32,485
3	21,111	1,919	10,000	12,245	10,000		– 6,766	34,345
4			10,000	8,746	10,000		– 5,249	14,751
5			10,000	6,247	10,000		– 4,549	15,450
6			10,000	6,247	10,000		– 4,549	15,450
7			10,000	6,247	10,000		– 4,549	15,450
8			10,000	3,125	10,000	– 7,000	– 1,715	11,285
	TOTAL							190,757

CUSTOM HIRE

End of year	(i) Custom hire charges	(j) Tax savings[2] (i)•(–0.28)	(k) Net cash outflow (i–j)
0			
1	37,000	– 10,360	26,640
2	37,000	– 10,360	26,640
3	37,000	– 10,360	26,640
4	37,000	– 10,360	26,640
5	37,000	– 10,360	26,640
6	37,000	– 10,360	26,640
7	37,000	– 10,360	26,640
8	37,000	– 10,360	26,640
TOTAL			213,120

[1] Negative signs imply a cash inflow rather than a cash outflow.

[2] Depreciation is based upon the Modified Accelerated Cost Recovery System (MACRS) as defined in the 1986 Tax Reform Act. Refer to the *Farmers Tax Guide* for additional information and details.

Exercise 1

Video questions

Indicate whether each of the following statements is true (T) or false (F).

T F 1. Financial leases for equipment usually require a set charge per hour of use.

T F 2. When doing a net present value comparison of cash versus credit purchases of machinery, operating costs can be ignored since they are the same for both alternatives.

T F 3. Operating costs need to be considered in evaluating purchase versus custom hire alternatives.

T F 4. If the total after-tax cash outflows for a financial lease are higher than the total after-tax cash outflows for a credit purchase, then the credit purchase is preferred.

T F 5. As the value placed upon unpaid operator labor increases, other things equal, the benefits of custom hiring relative to other alternatives are likely to increase.

T F 6. A financial lease is usually for a longer length of time than an operating lease.

T F 7. When evaluating machinery alternatives, the alternative with the lowest net present value of cash outflows is also the most feasible from a cash flow perspective.

T F 8. Intangible costs should always be ignored in evaluating machinery decisions because they are difficult to measure.

T F 9. Discounting is a procedure for expressing future cash flows in today's dollars.

T F 10. The higher the discount rate relative to the cost of borrowing money, the more likely is a credit purchase preferred over a cash purchase.

T F 11. If the purchase of machinery is feasible from a cash flow perspective, that means the farm profits are high enough to support the purchase.

T F 12. Financial leasing of machinery, prior to passage of the Tax Reform Act of 1986, was often motivated by tax considerations.

T F 13. When you acquire machinery under a financial lease, interest is a tax-deductible expense.

T F 14. Capital debt repayment capacity measures the cash flow feasibility of machinery purchases.

T F 15. Under a financial lease, the lessee (farmer) usually pays all operating and maintenance costs.

Exercise 2

Calculating net present value

In the videotape example, we calculated the net present value of the cash-purchase option for the machinery. For the sake of comparison, we now need to calculate the net present values for the other two options: credit purchase and financial lease. Using Appendix Tables 1 and 2 (pp. 13-15), calculate these two net present values.

1. Net present value: credit purchase

Year	Net cash flow	Discount factor @ 10%	Net present value
0	17,500		
1	16,841		
2	15,285		
3	17,145		
4	– 2,449		
5	– 1,749		
6	– 1,749		
7	– 1,749		
8	– 5,915		
TOTAL	53,160		

2. Net present value: financial lease

Year	Net cash flow	Discount factor @ 10%	Net present value
0	11,800		
1	8,496		
2	8,496		
3	8,496		
4	8,496		
5	8,496		
6	8,496		
7	8,496		
8	– 3,304		
TOTAL	67,968		

Exercise 3

Calculating discount factors, net present values and net after-tax cash flows

Net present value calculations require that future cash flows be discounted back to the present. The purpose of this exercise is to help you become better acquainted with the calculations required for discounting and determining net present values.

The formula for determining a discount factor is $\frac{1}{(1+i)^n}$. Appendix Table 1 (pp. 13-14) gives discount factors for various discount rates (i) and lengths of time (n).

1. Refer to Table 1. Look under i=5% and n=3. You should find the value 0.864. Using the discounting formula, illustrate how this number was calculated.

2. Suppose you are to receive $1,000 four years from now. What is the value in today's dollars of that money assuming an 8% discount rate?

3. Now suppose you are considering an investment which has the after-tax cash flows listed below. Using an 8% discount rate, what is the net present value of this investment?

Time period	After-tax cash flow	Discount factor @ 8%	Net present value
0	– 10,000	_____	_____
1	5,000	_____	_____
2	4,000	_____	_____
3	4,000	_____	_____
TOTAL			_____

4. Assuming now the same facts as in question 3, what is the net present value of the investment if you use instead a 20% discount rate?

Time period	After-tax cash flow	Discount factor @ 20%	Net present value
0	– 10,000	_____	_____
1	5,000	_____	_____
2	4,000	_____	_____
3	4,000	_____	_____
TOTAL			_____

5. Often the most difficult part of a net present value calculation is to determine the net after-tax cash flow. Determine the annual net after-tax cash outflows for the following investment.

Purchase cost	$ 50,000
Amount financed	$ 30,000
Principal payments/year	$ 10,000
Interest costs	10% on remaining balance
Depreciation	$10,000/year
Useful life	5 years
Salvage value	$ 8,000
Marginal tax rate	28%

Time	(a) Down payment	(b) Principal payments	(c) Interest payments	(d) Depreciation	(e) Salvage value	(f) Tax deductions	(g) Tax rate	(h) Tax savings	(i) Net after-tax cash outflows
0									
1									
2									
3									
4									
5									

6. Suppose you are evaluating two machinery investment alternatives and you have estimated the net after-tax cash outflows listed below. Using an 8% discount rate, which investment alternative is preferred?

	Net after-tax cash flow		Discount factor	Net present value	
Time	A	B	at 8%	A	B
0	50,000	40,000	_____	_____	_____
1	16,000	17,000	_____	_____	_____
2	14,000	17,000	_____	_____	_____
3	12,000	17,000	_____	_____	_____
4	10,000	4,000	_____	_____	_____
5	– 8,000	– 5,000	_____	_____	_____
TOTAL				_____	_____

Exercise 4

Evaluating credit purchase vs. financial lease

Suppose you are considering a credit purchase versus a financial lease on some new equipment. Use a net present value calculation to determine which alternative is the best. In your calculations, assume that you are in a marginal tax bracket of 28% and that an appropriate discount rate for you is 8%. Use Appendix Table 2 (p. 15) as a guide in preparing your analysis.

Credit purchase option

Down payment		$ 20,000
Amount financed		$ 40,000
Principal payments/year		$ 10,000 (for four years)
Interest		10% on remaining balance
Depreciation (MACRS)		
End of year		
1	8,571	
2	14,694	
3	10,496	
4	7,497	
5	5,355	
6	5,355	
7	5,355	
8	2,677	
TOTAL		$ 60,000
Salvage value		$ 6,000

Financial lease option

Lease payments (paid at start of each year)	$ 11,000
Number of lease payments	8
Equipment returned to lessor at end of year 8	

Answer key 1

Video questions

Indicate whether each of the following statements is true (T) or false (F).

T **F** 1. Financial leases for equipment usually require a set charge per hour of use.

Comment: False. A financial lease is usually a long-term contract which requires fixed lease payments over the life of the lease contract.

T F 2. When doing a net present value comparison of cash versus credit purchases of machinery, operating costs can be ignored since they are the same for both alternatives.

T F 3. Operating costs need to be considered in evaluating purchase versus custom-hire alternatives.

T **F** 4. If the total after-tax cash outflows for a financial lease are higher than the total after-tax cash outflows for a credit purchase, then the credit purchase is preferred.

Comment: False. To determine which alternative is preferred, one should discount all cash flows back to the present. That allows cash flows which occur at different points in time to be compared on a comparable basis.

T F 5. As the value placed upon unpaid operator labor increases, other things equal, the benefits of custom hiring relative to other alternatives are likely to increase.

T F 6. A financial lease is usually for a longer length of time than an operating lease.

T **F** 7. When evaluating machinery alternatives, the alternative with the lowest net present value of cash outflows is also the most feasible from a cash flow perspective.

Comment: False. The lowest net present value of cash outflows does not ensure cash flow feasibility. Often you must make a trade-off between cash flow feasibility and net present value.

T **F** 8. Intangible costs should always be ignored in evaluating machinery decisions because they are difficult to measure.

Comment: False. Intangible costs are difficult to measure, but they should not be ignored in making investment decisions.

T F 9. Discounting is a procedure for expressing future cash flows in today's dollars.

T F 10. The higher the discount rate relative to the cost of borrowing money, the more likely is a credit purchase preferred over a cash purchase.

T F 11. If the purchase of machinery is feasible from a cash flow perspective, that means the farm profits are high enough to support the purchase.

Comment: False. Profits do not ensure cash flow feasibility.

T F 12. Financial leasing of machinery, prior to passage of the Tax Reform Act of 1986, was often motivated by tax considerations.

T F 13. When you acquire machinery under a financial lease, interest is a tax-deductible expense.

Comment: False. When you lease machinery, only the lease payments are tax deductible.

T F 14. Capital debt repayment capacity measures the cash flow feasibility of machinery purchases.

Comment: False. Capital debt repayment capacity measures the "capacity" to handle capital debts, but it does not measure cash flow feasibility.

T F 15. Under a financial lease, the lessee (farmer) usually pays all operating and maintenance costs.

Answer key 2

Calculating net present value

In the videotape example, we calculated the net present value of the cash-purchase option for the machinery. For the sake of comparison, we now need to calculate the net present values for the other two options: credit purchase and financial lease. Using Appendix Tables 1 and 2 (pp. 13-15), calculate these two net present values.

1. Net present value: credit purchase

Year	Net cash flow	Discount factor @ 10%	Net present value
0	17,500	1.000	17,500
1	16,841	.909	15,308
2	15,285	.826	12,625
3	17,145	.751	12,876
4	– 2,449	.683	– 1,673
5	– 1,749	.621	– 1,086
6	– 1,749	.564	– 986
7	– 1,749	.513	– 897
8	– 5,915	.467	– 2,762
TOTAL	53,160		50,905

2. Net present value: financial lease

Year	Net cash flow	Discount factor @ 10%	Net present value
0	11,800	1.000	11,800
1	8,496	.909	7,723
2	8,496	.826	7,018
3	8,496	.751	6,380
4	8,496	.683	5,803
5	8,496	.621	5,276
6	8,496	.564	4,792
7	8,496	.513	4,358
8	– 3,304	.467	– 1,543
TOTAL	67,968		51,607

Answer key 3

Calculating discount factors, net present values and net after-tax cash flows

Net present value calculations require that future cash flows be discounted back to the present. The purpose of this exercise is to help you become better acquainted with the calculations required for discounting and determining net present values.

The formula for determining a discount factor is $\frac{1}{(1+i)^n}$. Appendix Table 1 (pp. 13-14) gives discount factors for various discount rates (i) and lengths of time (n).

1. Refer to Table 1. Look under i=5% and n=3. You should find the value 0.864. Using the discounting formula, illustrate how this number was calculated.

   $$\frac{1}{(1+i)^n}$$

   $$\frac{1}{(1+0.05)^3}$$

   $$\frac{1}{(1.05 \text{ X } 1.05 \text{ X } 1.05)}$$

   $$\frac{1}{1.157625} = \mathbf{0.864}$$

   Notice that if *n* is very large this process could be tedious and tables of discounting factors would be easier to use. It is good to understand the procedure, however, in case you need to use a discount rate which is not in a table.

2. Suppose you are to receive $1,000 four years from now. What is the value in today's dollars of that money assuming an 8% discount rate?

   Looking in Appendix Table 1 under i=8%, n=4 and we find the discount factor 0.735. We then multiply by that factor.

   $1,000 X 0.735 = **$735.00**

   Therefore, the $1,000 to be received four years from now is worth only $735 today. Stated another way, you could invest $735 at 8% interest and end up with $1,000 at the end of four years.

3. Now suppose you are considering an investment which has the after-tax cash flows listed below. Using an 8% discount rate, what is the net present value of this investment?

   To determine net present value we simply discount all cash flows back to the present. The present is considered to be time period zero.

Time period	After-tax cash flow	Discount factor @ 8%	Net present value
0	– 10,000	1.000	– 10,000
1	5,000	.926	4,630
2	4,000	.857	3,428
3	4,000	.794	3,176
TOTAL			1,234

   The net present value is a positive $1,234. That means this investment will generate $1,234 more dollars than your next-best investment alternative which yields an 8% after-tax return.

4. Assuming now the same facts as in question 3, what is the net present value of the investment if you use instead a 20% discount rate?

Time period	After-tax cash flow	Discount factor @ 20%	Net present value
0	– 10,000	1.000	– 10,000
1	5,000	.833	4,165
2	4,000	.694	2,776
3	4,000	.579	2,316
TOTAL			– 743

In this case the net present value is negative and you would be better off not making this investment. Instead you should invest your money in the alternative which will generate a 20% after-tax return on investment.

5. Often the most difficult part of a net present value calculation is to determine the net after-tax cash flow. Determine the annual net after-tax cash outflows for the following investment.

Purchase cost	$ 50,000
Amount financed	$ 30,000
Principal payments/year	$ 10,000
Interest costs	10% on remaining balance
Depreciation	$10,000/year
Useful life	5 years
Salvage value	$ 8,000
Marginal tax rate	28%

Time	(a) Down payment	(b) Principal payments	(c) Interest payments	(d) Depreciation	(e) Salvage value	(f) Tax deductions (c+d+e)	(g) Tax rate	(h) Tax savings (f•g)	(i) Net after-tax cash outflows (a+b+c+e–h)
0	20,000								20,000
1		10,000	3,000	10,000		13,000	.28	3,640	9,360
2		10,000	2,000	10,000		12,000	.28	3,360	8,640
3		10,000	1,000	10,000		11,000	.28	3,080	7,920
4				10,000		10,000	.28	2,080	– 2,800
5				10,000	– 8,000	2,000	.28	560	– 8,560

Notice that the cash outflows for years 4 and 5 are negative. This means the outflows were really cash inflows arising out of this investment.

6. Suppose you are evaluating two machinery investment alternatives and you have estimated the net after-tax cash outflows listed below. Using an 8% discount rate, which investment alternative is preferred?

	Net after-tax cash flow		Discount factor	Net present value	
Time	**A**	**B**	**at 8%**	**A**	**B**
0	50,000	40,000	1.000	50,000	40,000
1	16,000	17,000	.926	14,816	15,742
2	14,000	17,000	.857	11,998	14,569
3	12,000	17,000	.794	9,528	13,498
4	10,000	4,000	.735	7,350	2,940
5	– 8,000	– 5,000	.681	– 5,448	– 3,405
TOTAL				88,244	83,344

Since investment B has the lowest net present value of cash outflows, it is preferred over investment A. If your analysis included both cash inflows and cash outflows, then select the investment with the highest net present value of cash flows.

Answer key 4

Evaluating credit purchase vs. financial lease

Suppose you are considering a credit purchase versus a financial lease on some new equipment. Use a net present value calculation to determine which alternative is the best. In your calculations, assume that you are in a marginal tax bracket of 28% and that an appropriate discount rate for you is 8%. Use Appendix Table 2 (p. 15) as a guide in preparing your analysis.

Credit purchase option

Down payment		$ 20,000
Amount financed		$ 40,000
Principal payments/year		$ 10,000 (for four years)
Interest		10% on remaining balance
Depreciation (MACRS)		
End of year		
1	8,571	
2	14,694	
3	10,496	
4	7,497	
5	5,355	
6	5,355	
7	5,355	
8	2,677	
TOTAL		$ 60,000
Salvage value		$ 6,000

Financial lease option

Lease payments (paid at start of each year)	$ 11,000
Number of lease payments	8
Equipment returned to lessor at end of year 8	

As shown on page 32, the net present value of cash outflows for the loan is $44,108, while for the lease it is $50,568. Consequently, the loan is preferred on the basis of net present value of cash outflows.

Net present value of cash outflows: credit purchase vs. lease

	CREDIT PURCHASE					
End of year	(a) Down pymt & principal payments	(b) Interest payments	(c) Depreciation	(d) Salvage value	(e) Tax savings (b+c+d)•(–0.28)	(f) Net cash outflow (a+b+d+e)
0	20,000					20,000
1	10,000	4,000	8,571		– 3,520	10,480
2	10,000	3,000	14,694		– 4,954	8,046
3	10,000	2,000	10,496		– 3,499	8,501
4	10,000	1,000	7,497		– 2,375	8,621
5			5,355		– 1,499	– 1,499
6			5,355		– 1,499	– 1,499
7			5,355		– 1,499	– 1,499
8			2,677	– 6,000	930	– 5,070
TOTAL	60,000	10,000	60,000	– 6,000	– 17,919	46,081

	LEASE				NET PRESENT VALUE	
End of year	(g) Lease payments	(h) Tax savings (g_{t-1})•(–0.28)	(i) Net cash outflow (g+h)	(j) Discount rate @ 8%	(k) Loan (f•j)	(l) Lease (i•j)
0	11,000		11,000	1.000	20,000	11,000
1	11,000	– 3,080	7,920	.926	9,705	7,334
2	11,000	– 3,080	7,920	.857	6,895	6,787
3	11,000	– 3,080	7,920	.794	6,750	6,288
4	11,000	– 3,080	7,920	.735	6,336	5,821
5	11,000	– 3,080	7,920	.681	– 1,021	5,394
6	11,000	– 3,080	7,920	.630	– 945	4,990
7	11,000	– 3,080	7,920	.583	– 874	4,617
8	0	– 3,080	– 3,080	.540	– 2,738	– 1,663
TOTAL	88,000	– 24,640	63,360		44,108	50,568

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