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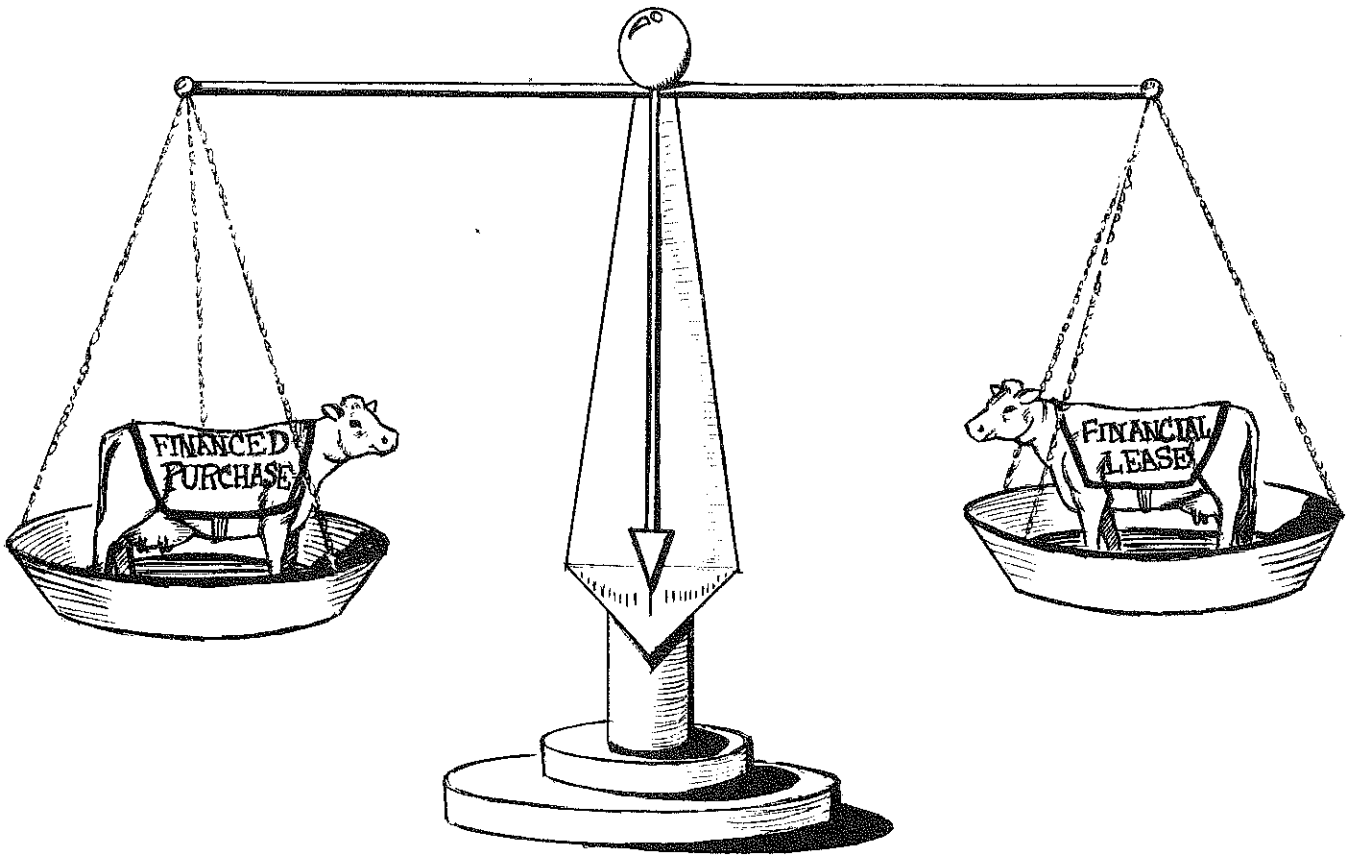
A PROCEDURE FOR ANALYZING DAIRY COW FINANCIAL LEASES



by

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Note to Readers: Throughout this publication the term farmer will be used to indicate the person who conducts the dairy operation (is responsible for the milking and care of the animals). Investor refers to the person who owns the cows and leases them to the farmer. Legally, the investor is also a farmer (particularly for tax purposes) and in some cases (s)he may actually operate a dairy farm. However, use of the term "investor" allows for easier communication.

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A PROCEDURE FOR ANALYZING DAIRY COW FINANCIAL LEASES

by

Eddy L. LaDue

Farmers who are considering dairy cow financial leases normally can be divided into two groups. Group 1 consists of people who cannot borrow the funds to finance purchase of the dairy cows. Group 2 includes those who can borrow the amount needed to finance purchase of animals but believe that leasing may be more profitable than purchase.

For those in group 1 interest rates are unimportant and economic evaluation of leasing involves determining whether it is most profitable to lease (additional) cows or not have (additional) cows. This economic evaluation normally is accomplished through use of a partial or whole farm budget to determine the economic profitability and financial feasibility of operating the farm with (additional) cows relative to not have the added cows or not dairy farming.

The evaluation procedure presented in this publication is designed for farmers in group 2. For these farmers the question is whether to lease cows or borrow the money and purchase them. The evaluation procedure presented uses a series of four tables which lead to an after tax net present value analysis of the desirability of leasing. The analysis evaluates both the relative economic profitability and the cash flow impacts of the lease.

Research on Dairy Cow Financial Leases

This publication does not include research information on leases. A study has been completed which investigates the characteristics of typical leases, the profitability of typical leases for both the investor and the dairy farmer, the characteristics of farmers most likely to benefit from leasing, normal cash flow characteristics of leases and clauses to look for and look out for in leases. The results of that study are contained in: "The Economics of Financial Leasing of Dairy Cows" Agricultural Economics Research Bulletin 82-21. This publication can be obtained from: Publications Room, 442 Warren Hall, Cornell University, Ithaca, NY 14853-0398.

Evaluating Lease Profitability

Basically the procedure presented for evaluating dairy cow leases involves determining the after tax costs with leasing and comparing those costs to the after tax costs of borrowing the money and purchasing the animals. It is assumed that the quality of the cows obtained will be the same with either lease or purchase. Thus, total gross income will be the same with either lease or purchase and the most economical method of obtaining cows is the one with lowest cost.

One of the reasons investors are interested in leases is that they receive considerable tax benefits. Many tax benefits that the farmer would receive if (s)he purchased the cows are shifted to the investor through a lease. Because of these tax effects, a lease cannot be correctly evaluated on a before tax basis. For that reason all cash flows are converted to an after tax basis and Investment Tax Credit and recapture are included in the analysis.

Because the timing of expenses may differ for lease versus purchase, any appropriate evaluation technique must also account for the time value of money (a dollar received today is worth more than a dollar received sometime in the future). To do this all costs and returns are discounted to convert them to their present value equivalent.1/ Final evaluation involves comparison of the present value of all after tax costs with the lease and the present value of all after tax costs with purchase.

The Example Farm

To assist in understanding of the anlaysis procedure an example farm situation and lease will be used throughout the discussion (table 1). Both the farm situation and the lease are typical in all respects but do not represent any particular farm or any actual lease.

Table 1. Example Farm and Lease Situation

Description	Value
Farm Situation:	
1. Farmer's marginal tax bracket (combined state and federal)	30%
2. Before tax discount rate (weighted average cost of capital)	13%
3. Culling rate	25%
4. Value of cows to be purchased or leased	$1,300
5. Value received for cull cows	$ 500
6. Value of calves at birth	$ 70
7. Replacement cost	$1,300
8. Calves born per cow per year (13 month calving interval and 10% mortality = 12/13 x .9)	.83
Lease Characteristics:	
1. Monthly lease payment per cow (one lease payment required at time cows are delivered - all other monthly payments made in advance)	$ 30
2. Security deposit required at time lease is signed (returned at time cows are picked up by lessor)	$ 25
3. Insurance on the cows is carried by the lessor (.5% of cow value)	$ 7
4. Minimum lease period is 1 year with automatic renewal (60 day notice required to terminate lease at end of any year)	
5. All replacements are provided by the investor. Culling decisions are made by mutual agreement between the investor and the farmer. All calves are the property of the investor.	
Purchase (Loan) Characteristics:	
1. Loan repayment period	4 years
2. Interest rate	16%
3. Frequency of payments	monthly

1/ All cash flows are handled on a annual basis. Since many of the flows actually occur on a monthly basis a more accurate analysis could be obtained by discounting flows on a monthly basis. However, such a procedure makes calculation extremely cumbersome and would have only a minor impact on the results. Since both lease payments and loan payments are normally monthly, the impact will be similar for both lease and purchase.

Organization of Analysis Procedure:

The analysis is accomplished by completing four tables. For ease of identification these tables have been labeled:

Table L	Lease Cost Analysis
Table P	Purchase Cost Analysis
Table N	Net Advantage of Lease
Table C	Cash Flow Analysis

Each line of these tables is identified by a lower case letter. Thus, any line in any table can be referred to with a capital and lower case letter. For example, line La refers to the first line (line a) of table L (Lease Cost Analysis).

Appropriate analysis of a lease is a reasonably complicated process. To make this as easy as possible a number of tables have been prepared that summarize calculations. These tables have been numbered one through five and appear in the back of this publication. When information from one of these tables is required, the appropriate table to reference is indicated with the capital letter T followed by the number of the table to use. For example, line Pe (Table P, line e) requires data from table 3. Thus, T3 appears after the identification of the item needed.

In applying this procedure you can make your calculations for the number of animal to be leased or for a single representative cow. The calculations are normally easier when the analysis is done for a representative cow and that is the procedure followed in the example. When entries are made on a per cow basis care must be taken to insure that all entries are the amount per cow not per lease.

Replacement costs are included in the lease analysis only if the lease provides replacements for culled animals. In cases where the farmer provides replacements for leased animals the cost of replacements can be ignored since the farmer will have to provide replacements regardless of whether the animals are leased or purchased.

In the discussion that follows the appropriate entry and interpretation of each line is reviewed. The discussion relative to each line is identified by line number for ease in reference. It is suggested that all entries be rounded to the nearest dollar except lines Li, Ll, Pb, Pm, Pv and Nd.

In order to obtain an appropriate comparison the lease period considered must be the same as the purchase (loan) period it is compared to. If the term of the lease is shorter than the loan period, assume that the lease is renewed for at least the period of the loan. For example, if the lease period is one year and loan funds would be repaid over four years, assume the lease is continued for four years. Similarly, if the lease term is longer than the loan term, calculate purchase and loan costs for the entire lease period.

Lease Cost Analysis - Table L

This table is designed to determine the net costs of the lease. Since some leases provide items for which farmers would normally have to pay (insurance, breeding) the value of these items is subtracted to obtain net lease costs. Round all values in this table to the nearest dollar except lines Li and Ll.

La. On this line enter the lease payments made during each year. Under year 0 enter all advance payments made at the time or before the lease starts (the cows delivered). If advance payments are made remember to include in the last year only the actual payments to be made. For example, if one monthly payment is made in advance, only 11 monthly payments will be made in the last year.

Lb. Enter the value of any heifers provided by the farmer to the investor. The value to use will normally be the amount that could be received for the animals at the time title is transferred to the investor. In the last year of the lease there will be yearlings and calves being raised that will be transferred to the lessor at the end of the lease. These should be also valued and entered as a cost.

For example, if the farmer is to raise for the investor one heifer per year for every 10 cows leased, the farmer will be starting heifers each year and will transfer animals to the investor starting in year three. If these heifers could be sold for $1,500 each, the cost per cow leased would be $150 per year ($1,500 x 1/10 heifer per cow) from year three through the end of the lease. If yearlings are valued at $700 each and calves at $100 each, the total value of heifers transferred to the investor in the final year of the lease is $150 for bred heifers (calculated above) plus $70 for yearlings ($700 x 1/10) plus $10 for calves ($100 x 1/10) for a total of $230.

Lc. Enter the amount of the deposit in year zero and enter the return of the deposit (as a negative value) in the last year of the lease.

Ld. Enter any other costs connected with the lease. Examples might include extra labor required for special breeding or embryo transfer programs, income (entered as a negative value) or loss from raising replacements or bulls for the investor, increased breeding costs or heifer insurance costs.

For example, assume the farmer agreed to raise one heifer each year for every four cows leased and the investor would pay $40 per month for raising animals. If a seven year lease was used and the costs of raising replacements in years one through seven were expected to be $30, $35, $40, $45, $50, $55 and $60 per month respectively, the costs connected with raising these replacements would be $-2.50 ($30-$40x1/4), $-1.25, $0, $1.25, $2.50, $3.75 and $5.00 ($50-$30x1/4), for years one through seven respectively.

Le. Enter the value of fire and casuality insurance preminums on the cows that are paid by the investor. If the farmer owned the cows (s)he would have to pay this insurance and, thus, this represents a savings to the farmer. Enter the preminum per cow the farmer would pay if animals were purchased. The insurance preminum on cows is frequently approximately .5% of cow value. Thus, for our example farm the insurance cost savings is $6.50 ($1,300 x .5%).

Lf. Enter any breeding fees paid by the investor that would be paid by the farmer if (s)he owned the cows. Do not include unusual or above normal fees that are required by the investor but would not be incurred if animals were purchased.

Table L. LEASE COST ANALYSIS
(Round all values to the nearest dollar except lines i and l)

Item	Year 0	1	2	3	4	5	6	7
a. Lease payment	$ 30 a/	$ 360	$ 360	$ 360	$ 330	$	$	$
Other costs:								
b. Heifers	+	+	+	+	+			
c. Deposit	+ 25	-	-	-	- 25	-	-	-
d.	+	+	+	+	+	+	+	+
Costs Saved:								
e. Insurance	-	- 7	- 7	- 7	- 7	-	-	-
f. Breeding	-	-	-	-	-	-	-	-
g.	-	-	-	-	-	-	-	-
h. Net Cost	55	353	353	353	298			
i. Tax rate (decimal form)	.30	.30	.30	.30	.30			
j. Tax reduction (h x i)	17	106	106	106	89			
k. Net after tax cost (h - j)	38	247	247	247	209			
l. P.V. factor (after tax-T4)(9%)	1.00	.92	.84	.77	.71			
m. Net present value	38	227	207	190	148			
n. Total net present value of costs						810		

a/ Extra advance payments.

For example, if the investor provided all semen and paid for insemination at a cost of $50 per cow , but, the farmer's normal breeding costs were $18 per cow, the costs saved are $18 per cow and the $18 per cow should be entered in table L.

Lg. Enter any other costs saved as a result of the lease. This will normally be items that the investor pays that the farmer would pay if animals were purchased. Examples include DHIA fees or pregnancy check costs.

Lh. Net cost is calculated by summing the items listed above. Be sure to add or subtract depending upon the sign of the value entered; do not just add up all numbers in the column.

Li. Enter the tax rate. The appropriate tax rate to use is the combined marginal federal and state rates. Since state taxes are deductible from federal taxable income in calculating federal taxes the combined federal and state rate is calculated by the formula:

[Federal rate x (1.0 - State rate expressed as a decimal)] + State rate
For example, if the marginal federal rate is 24 percent and the marginal state rate is 8 percent the combined marginal tax rate = 24(1-.08)+8
= 24(.92)+8
= 22+8
= 30

If the business is sufficiently unprofitable or expanding so rapidly that net taxable income will be at or near zero enter a zero tax rate. However, if no taxes are paid because of the use of investment tax credit, use the marginal rates implied by the tax liability prior to application of Investment Tax Credit.

Lj. Multiply line h times line i. This calculates the reduction in taxes that result from the tax deductibility of the lease costs.

Lk. Subtract line j from line h and enter the result. This is the after tax cost of the lease.

Ll. First, calculate the after tax discount rate. This is accomplished by multiplying the before tax discount rate by one minus the tax rate expressed as a decimal. For our example farm, the after tax discount rate

= 13 x (1 - .3)
= 13 x .7
= 9.1 (which rounds to 9%)

Enter the discount rate in the parenthesis on line Ll for future reference.

The before tax discount rate is the weighted average cost of debt and equity capital. For most farm situations use of the average interest rate expected to be paid on farm loans over the lease period can be used without significantly biasing the results. Second, find the column in table 4 which is headed by the after tax discount rate. Finally, enter the value from that column in line Ll for each year of the lease.

Lm. The net present value is calculated by multiplying the after tax cost (line Lk) by the present value factor (line Ll).

Ln. Add all entries in line Lm. The total net present value of costs is calculated by summing the present values for the individual years which are entered in line Lm.

Purchase Cost Analysis - Table P

This table is designed to determine the net costs for purchase of the animals with borrowed funds.

Pa. Enter the total annual principal and interest payments made per cow. This is calculated by multiplying the value of the cow (expressed in 1,000 of dollars) times the appropriate value from table 1, and multiplying the resulting value by 12 (the number of months in a year). For our example, the number of $1,000's of debt equals 1.3 ($1,300/1,000) and total annual payments equals $442 (1.3 x $28.35 x 12). Remember to enter these values only for the number of years for which payments will be made.

Pb. Enter the proportion (percent in decimal form) of each loan payment that is interest. This is taken from table 2 which indicates the proportion of the total payments made each year that represent interest. To use table 2, start by identifying the subtable of table 2 that corresponds with the repayment period of the loan. Then use the interest rate to identify the correct row of the table to use. Enter the values from that table in line Pb. If the interest rate is between those listed, interpolate between the proportion indicated for the rates above and below the actual rate.

Pc. Enter the amount of each year's total loan payment that is interest. This is calculated by multiplying line a by line b.

Pd. If the investor provides replacements as part of the lease, enter the annual value of replacements required. To make the calculations on a per cow basis multiply the culling rate (expressed as a decimal) by the value of replacements. Enter the culling rate used in the parentheses provided. If replacements are not provided by the investor, leave this line blank. In this case replacement costs will be the same with lease or purchase and can be ignored.

The appropriate value to use for replacements may be different for different situations. When replacements will not be raised if cows are leased the appropriate value to use is the cost of raising replacements on the farm. In this case, you are actually comparing leasing to purchase-of-cows-and-raising-replacements. If the heifer raising function could be continued even if cows are leased or you want to evaluate leasing independent of any loss or gain in growing heifers, use the market value of heifers at the time they are used as replacements.

Pe. Enter the depreciation that will be taken on the purchased cows. This is calculated by multiplying the purchase price of the cows by the appropriate values from table 3. The appropriate value from table 3 is determined by first moving to that section of table 3 identified by the culling rate used (and listed in line d). Then determine the percent that the expected cull value is of the purchase price and use that value to identify the appropriate row of values in table 3 to use.

Table P. Purchase Cost Analysis

Item	Year 1	2	3	4	5	6	7
Before Tax:							
Loan payment							
a. Total (T1 x 12)	442	442	442	442			
b. Interest proportion (T2)	.43	.33	.22	.08			
c. Interest (a x b)	190	146	97	35			
d. Replacements (25%)	325	325	325	325			
e. Depreciation (T3 x value)	338	286	143	13			
f. Calves (value x number)	58	58	58	58			
g. Invest. tax credit - Fed.	130						
h. - State	78						
i. Terminal value				1300			
j. Cap. gains income (i x .4)				520			
k. Tax (j x tax rate)				156			
After Tax:							
l. Tax deduct. exp. (c+d+e-f)	795	699	507	315			
m. Tax rate (decimal form)	.30	.30	.30	.30			
n. Tax reduction (l x m)	239	210	152	95			
o. Cash outflow (a+d-f)	709	709	709	709			
p. After tax cost (o-n)	470	499	557	614			
q. Invest. tax credit (g+h)	-208						
r. ITC recapture - Fed.[a/]	+ 26	+ 20	+ 13	+ 7			
s. - State[b/]	+ 16	+ 12	+ 8	+ 4			
t. Cow terminal value (i-k)			-	-1144	-	-	-
u. Net after tax cost (p-q+r+s-t)	304	531	578	-519			
v. P.V. factor (after tax-T4)	.92	.84	.77	.71			
w. Net present value (u x v)	280	446	445	-368			
x. Total net present value of costs					803		

a/ Total federal ITC (f) x culling rate (in decimal form) x % recapture (expressed as a decimal); where % recapture expressed as a decimal is .80, .60, .40 and .20 in years 1, 2, 3 and 4 respectively.

b/ Total state ITC (g) x culling rate (decimal form) x % recapture (decimal form); where % recapture = $\frac{\text{Expected Life - Actual Life (year)}}{\text{Expected Life}}$. For a five year expected life; % recapture (in decimal form) is .80, .60, .40 and .20 for years 1 through 4 respectively.

For our farm example the culling rate is 25 percent. The cull cow value is $500 and the price of cows is $1,300. Thus, the appropriate row of table 3 to use is under the 25 percent culling rate and across from 40 percent ($500/$1,300 = 38.5% which is closest to 40%). Therefore the depreciation taken in the first year is $338 ($1,300 x .26).

Use of table 3 approximates the depreciation that will be taken for the given culling rate using 1982 tax depreciation (cost recovery) methods. Table 3 is constructed under the assumption that a proportion of all animals are culled each year. That is with a 25 percent culling rate 25 percent of the animals purchased are culled each year. In fact some of the purchased animals will live longer but some of the first year replacements will have to be replaced in the second year, and maybe again in the third year, etc. Thus, the true economic impacts are closely represented by this procedure.

The negative values in table 3 occur because the new cost recovery methods do not require use of a salvage value and an animal can be depreciated to less than her market value before she is culled, resulting in ordinary gain (negative depreciation).

Table 3 values are high in early years because the values recognize the fact that those animals culled early have effective depreciation far in excess of the amount allowed on an animal that is not culled. For example, a $1,300 cow that is culled in the first year for which a cull value of $500 is received, has effective depreciation of 62 percent ($800/$1,300).

Pf. If the farmer does <u>not</u> receive the calves from leased cows, enter the value of calves produced per cow per year. If the farmer receives the calves from leased cows, (s)he obtains them with either lease or purchase and, thus, calves can be ignored. In this case this line (Pf) should be left blank.

To determine the value of calves produced per year, first determine the number of calves produced per cow. Since the culling interval is usually greater than 12 months and there will be some calf mortality, the number of calves sold per cow will usually be less than one. The number of calves per cow can be estimated as:

$$\frac{12}{\text{Calving Interval}} \times (1 - \text{mortality rate expressed as a decimal})$$

For our example this = 12/13 x (1 - .10)
= 12/13 x .9
= .83

The value of calves is then calculated by multiplying the number of calves by the value per calf. In our example this is $58 ($70 x .83).

Pg. If the business will have federal tax liability in the year the cows are purchased, or soon thereafter, that Investment Tax Credit can be used against, enter the Federal Investment Tax Credit that is earned when the animals are purchased. Under 1982 tax law the Investment Tax Credit allowed is 10 percent of the purchase price of the animal. If federal taxable income will be near zero or there is excess Investment Tax Credit from other investments so that added Investment Tax Credit would go unused for a number of years, leave this blank.

Ph. If the business will have state tax liability in the year the cows are purchased, or soon thereafter, that Investment Tax Credit (ITC) can be used against, enter the State Investment Tax Credit allowable on purchased animals. New York State investment credit is 6 percent of the purchase price. If state taxable income will be near zero or there is excess State Investment Tax Credit from other investments so that the added ITC would go unused for a number of years, leave this line blank.

Pi. Enter the value of the cow at the end of the lease period in the final year column.

Note: To appropriately compare leasing and purchase we must calculate all costs and benefits to get the farmer to the same position at the end of the lease period with either purchase or lease. Assuming that the cow is sold under the purchase option makes the farmer's position with purchase the same as with lease. That is (s)he does not own cows in either case. An equivalent result could be accomplished by requiring purchase of animals at the end of the lease. However, this is more difficult to handle in the analysis.

Pj. Enter the amount of the terminal value of the cow that would be taxed if the animal were sold at the end of the planning (lease) period. This can be calculated by multiplying the terminal value of the cow by the capital gains tax rate (.4 in 1982).

Pk. Enter the tax that would be paid on the value received for the cow if she were sold at the end of the planning (lease) period. This is calculated by multiplying line j by the tax rate.

Pl. Enter net tax deductible expense. This is calculated by summing lines c, d and e and subtracting line f. Line f is subtracted because the calves represent taxable income that offsets tax deductible expenses.

Pm. Enter the combined federal and state marginal rate. This is the same as the values entered on line Li. (See line Li description for a more detailed discussion).

Pn. The tax reduction resulting from the expenses connected with purchase are calculated by multiplying line l by line m.

Po. Add line a and d and subtract line f. This represents the actual before tax cash outflow from the investment.

Pp. Add lines n and o. Observe the signs on the numbers (i.e., effectively subtract line n from line o). This line represents the after tax cost of purchase except for ITC and the terminal value of the cow.

Pq. Enter the total State and Federal Investment Tax Credit calculated in lines g and h.

Pr. Enter the expected level of Federal Investment Tax Credit recapture. Investment Tax Credit must be recaptured on cows held for less than five years. When cows are culled prior to the fifth year 20 percent of the ITC taken must be recaptured for each year less than five that the animal is held. The expected amount of ITC recapture can be esti-

mated for each year by multiplying the amount of federal credit taken (line Pg) by the culling rate and multiply the result by the percent of Investment Tax Credit recapture in that year. The percent recaptured (expressed as a decimal) is .80, .60, .40 and .20 for years one through four respectively. For our example farm, ederal ITC taken is $130 and the culling rate is 25 percent. Thus, the first years ITC recapture is $26 ($130 x .25 x .80) and second year recapture is $20 ($130 x .25 x .60).

Ps. Enter the expected State Investment Tax Credit recapture. New York State requires recapture if the animal is held less than its expected life. Consistency with federal legislation implies a five year expected life. Thus, recapture is required on animals kept less than five years. The proportion recaptured is calculated as: $\frac{\text{expected life - actual life}}{\text{expected life}}$.

For a five year expected life the proportion is .80, .60, .40 and .20 for years one through four respectively. For our example farm, first year state ITC recapture is $16 ($78 x .25 x .80).

Pt. Enter the after tax value that would be received if the cows were sold at the end of the period. This is calculated as line Pi minus line Pk. Enter in only one year.

Pu. Net after tax cost is calculated by summing lines p through s while observing the signs on the values. Investment tax credit and the cow terminal value represents negative costs (income) and thus must be subtracted. After tax cost may be positive or negative.

Pv. Enter present value factors from table 4 as explained for line Ll. The values are the same as those used in line Ll.

Pw. Enter the net present value of total costs for each year. This is obtained by multiplying line u by line v.

Px. Total net present value of costs are calculated by adding the net present value of costs for each year.

Net Advantage of Lease - Table N

Table N summarizes the net advantage or disadvantage of leasing.

Na. Enter the net present value of purchase from line Px of the purchase cost analysis.

Nb. Enter the net present value of the lease from line Ln of the lease cost analysis.

Nc. Subtract line b from line a. This line indicates the net present value of the advantage of leasing. If it is positive it indicates the amount that the farmer would have to be paid on the day the lease is initiated in order to make purchase with borrowed funds equal in total cost to leasing. If the number is negative, it indicates the amount that the investor (or someone else) would have to pay the farmer on the first day of the lease in order to make the profitability of leasing equal to the profitability of purchase with borrowed funds. For our example farm leasing and purchase are nearly equivalent in cost.

Table N. NET ADVANTAGE OF LEASE

a.	Net present value of purchase (Px)	$ 803
b.	Net present value with lease (Ln)	- 810
c.	Net after tax advantage of lease	$ - 7
d.	Net present value factor (after tax - T5)	÷ 3.24
e.	Annual after tax advantage of lease	$ - 2

Table C. CASH FLOW ANALYSIS
After Tax Basis

Item	Year 0	1	2	3	4	5	6	7
After tax outflow:								
a. Purchase (Pu)		295	532	584	-516			
b. Lease (Lk)	38	247	247	247	209			
c. Annual cash flow advantage (a-b) with lease	-38	48	285	337	-725			
d. Cumulative cash flow advantage of lease	-38	10	295	632	-93			

Nd. Enter the present value factor from table 5 for the after tax discount rate (calculated for line Ll) and the number of years for which the analysis is conducted. For our example farm the after tax discount rate is 9 percent and the number of years analyzed is four.

Ne. The annual after tax advantage of the lease is calculated by dividing line c by line d. The annual after tax advantage of the lease indicates the annual after tax income stream that is equal to the net after tax earnings from leasing instead of purchasing. The net income from the lease is unevenly distributed throughout the life of the lease so the lease will not generate exactly that much more income each and every year, but the income generated is equivalent to receiving the annual after tax advantage of the lease each year of the lease period. If the advantage of the lease is negative the annual after tax advantage is interpreted in the same way except that it indicates the advantage of purchase over lease.

Cash Flow Analysis - Table C

The cash flow analysis calculates the cash flow implications of the lease. Because leasing normally involves transfer of tax benefits to the investor, the after tax cash flows must be used in determining cash flow impacts.

Ca. Enter the after tax cash outflows with purchase. This is identical to the after tax cost indicated in line Pu.

Cb. Enter the after tax cash outflow with purchase. This is identical to the after tax cost indicated in line Lk.

Cc. The annual after tax cash flow advantage is calculated by subtracting line b from line a. This indicates the annual after tax cash flow advantage during each year of the lease. For our example farm the lease exhibited a cash flow advantage in years 1, 2 and 3 with only a modest cash flow disadvantage at the time the lease is initiated (year zero).

Cd. The cumulative cash flow advantage of the lease is calculated for each year by addint that year's cash flow advantage (line c value) to the sum of all preceding year's cash flow advantage (line d value for the previous year). The cumulative advantage can be very useful in providing a picture of the aggregate cash flows of the lease. In particular it indicates the point in the life of a lease where a cash flow advantage is obtained or lost. For our example farm a modest initial cash flow disadvantage is offset in the first year and a large cash flow advantage is generated over the first three years.

Summary

An appropriate method of analyzing dairy cow leases compared to purchasing the cows with borrowed money is developed and explained. A set of forms and tables are presented which allow incorporation of new cost recovery methods and the time value of money into calculation of the after tax profitability and cash flow impacts of a lease. An example farm and lease situation are used throughout the discussion to illustrate use of the procedure.

A series of blank forms are provided on the following pages to allow the reader to evaluate his or her particular lease and farm situation. Additional copies of the blank forms can be obtained from the author.

COW LEASE EVALUATION WORKSHEETS

to be used with

Agricultural Economics Extension Bulletin 82-22

"A Procedure For Analyzing Dairy Cow Financial Leases"

Prepared by
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Table L. LEASE COST ANALYSIS

(Round all values to the nearest dollar except lines i and l)

Item	Year 0	1	2	3	4	5	6	7
a. Lease payment	$ a/	$	$	$	$	$	$	$
Other costs:								
b. Heifers	+	+	+	+	+			
c. Deposit	+	-	-	-	-	-	-	-
d.	+	+	+	+	+	+	+	+
Costs Saved:								
e. Insurance	-	-	-	-	-	-	-	-
f. Breeding	-	-	-	-	-	-	-	-
g.	-	-	-	-	-	-	-	-
h. Net Cost								
i. Tax rate (decimal form)								
j. Tax reduction (h x i)								
k. Net after tax cost (h - j)								
l. P.V. factor (after tax-T4)(__)								
m. Net present value								
n. Total net present value of costs								

a/ Extra advance payments.

Table P. Purchase Cost Analysis

Item	Year 1	2	3	4	5	6	7
Before Tax:							
Loan payment							
a. Total (T1 x 12)							
b. Interest proportion (T2)							
c. Interest (a x b)							
d. Replacements (_____)							
e. Depreciation (T3 x value)							
f. Calves (value x number)							
g. Invest. tax credit - Fed.							
h. - State							
i. Terminal value							
j. Cap. gains income (i x .4)							
k. Tax (j x tax rate)							
After Tax:							
l. Tax deduct. exp. (c+d+e-f)							
m. Tax rate (decimal form)							
n. Tax reduction (l x m)							
o. Cash outflow (a+d-f)							
p. After tax cost (o-n)							
q. Invest. tax credit (g+h)	-						
r. ITC recapture - Fed.[a/]	+	+	+	+			
s. - State[b/]	+	+	+	+			
t. Cow terminal value (i-k)			-	-	-	-	-
u. Net after tax cost (p-q+r+s-t)							
v. P.V. factor (after tax-T4)							
w. Net present value (u x v)							
x. Total net present value of costs							

a/ Total federal ITC (f) x culling rate (in decimal form) x % recapture (expressed as a decimal); where % recapture expressed as a decimal is .80, .60, .40 and .20 in years 1, 2, 3 and 4 respectively.

b/ Total state ITC (g) x culling rate (decimal form) x % recapture (decimal form); where % recapture = $\frac{\text{Expected Life - Actual Life (year)}}{\text{Expected Life}}$. For a five year expected life; % recapture (in decimal form) is .80, .60, .40 and .20 for years 1 through 4 respectively.

Table N. NET ADVANTAGE OF LEASE

a.	Net present value of purchase (Px)	$_____
b.	Net present value with lease (Ln)	-_____
c.	Net after tax advantage of lease	$_____
d.	Net present value factor (after tax - T5)	+_____
e.	Annual after tax advantage of lease	$_____

Table C. CASH FLOW ANALYSIS
After Tax Basis

Item	Year 0	1	2	3	4	5	6	7
After tax outflow:								
a. Purchase (Pu)	____	____	____	____	____	____	____	____
b. Lease (Lk)	____	____	____	____	____	____	____	____
c. Annual cash flow advantage (a-b) with lease	____	____	____	____	____	____	____	____
d. Cumulative cash flow advantage of lease	____	____	____	____	____	____	____	____

APPENDIX A

Cow Lease Evaluation

Tables 1-5

Table 1. MONTHLY PAYMENTS REQUIRED TO AMORTIZE $1000*

Even Payments, Principal and Interest

Interest Rate (%)	Repayment Period (years)								
	1	2	3	4	5	6	7	8	9
1.0	83.79	42.11	28.21	21.27	17.10	14.32	12.34	10.85	9.69
1.5	84.02	42.33	28.43	21.48	17.31	14.54	12.55	11.07	9.91
2.0	84.24	42.55	28.65	21.70	17.53	14.76	12.77	11.29	10.13
2.5	84.47	42.77	28.87	21.92	17.75	14.98	12.99	11.51	10.35
3.0	84.70	42.99	29.09	22.14	17.97	15.20	13.22	11.73	10.58
3.5	84.93	43.21	29.31	22.36	18.20	15.42	13.44	11.96	10.81
4.0	85.16	43.43	29.53	22.58	18.42	15.65	13.67	12.19	11.05
4.5	85.38	43.65	29.75	22.81	18.65	15.88	13.91	12.43	11.28
5.0	85.61	43.88	29.98	23.03	18.88	16.11	14.14	12.66	11.52
5.5	85.84	44.10	30.20	23.26	19.11	16.34	14.37	12.90	11.77
6.0	86.07	44.33	30.43	23.49	19.34	16.58	14.61	13.15	12.01
6.5	86.30	44.55	30.65	23.72	19.57	16.81	14.85	13.39	12.26
7.0	86.53	44.78	30.88	23.95	19.81	17.05	15.10	13.64	12.51
7.5	86.76	45.00	31.11	24.18	20.04	17.30	15.34	13.89	12.77
8.0	86.99	45.23	31.34	24.42	20.28	17.54	15.59	14.14	13.02
8.5	87.22	45.46	31.57	24.65	20.52	17.78	15.84	14.40	13.28
9.0	87.46	45.69	31.80	24.89	20.76	18.03	16.09	14.66	13.55
9.5	87.69	45.92	32.04	25.13	21.01	18.28	16.35	14.92	13.81
10.0	87.92	46.15	32.27	25.37	21.25	18.53	16.61	15.18	14.08
10.5	88.15	46.38	32.51	25.61	21.50	18.78	16.87	15.45	14.36
11.0	88.39	46.61	32.74	25.85	21.75	19.04	17.13	15.71	14.63
11.5	88.62	46.85	32.98	26.09	22.00	19.30	17.39	15.98	14.91
12.0	88.85	47.08	33.22	26.34	22.25	19.56	17.66	16.26	15.19
12.5	89.09	47.31	33.46	26.59	22.50	19.82	17.93	16.53	15.47
13.0	89.32	47.55	33.70	26.83	22.76	20.08	18.20	16.81	15.76
13.5	89.56	47.78	33.94	27.08	23.01	20.34	18.47	17.09	16.05
14.0	89.79	48.02	34.18	27.33	23.27	20.61	18.74	17.38	16.34
14.5	90.03	48.25	34.43	27.58	23.53	20.88	19.02	17.66	16.63
15.0	90.26	48.49	34.67	27.84	23.79	21.15	19.30	17.95	16.93
15.5	90.50	48.73	34.92	28.09	24.06	21.42	19.58	18.24	17.23
16.0	90.74	48.97	35.16	28.35	24.32	21.70	19.87	18.53	17.53
16.5	90.97	49.21	35.41	28.60	24.59	21.97	20.15	18.83	17.83
17.0	91.21	49.45	35.66	28.86	24.86	22.25	20.44	19.13	18.14
17.5	91.45	49.69	35.91	29.12	25.13	22.53	20.73	19.43	18.45
18.0	91.68	49.93	36.16	29.38	25.40	22.81	21.02	19.73	18.76
18.5	91.92	50.17	36.41	29.64	25.67	23.10	21.32	20.03	19.08
19.0	92.16	50.41	36.66	29.91	26.95	23.38	21.61	20.34	19.39
19.5	92.40	50.66	36.91	30.17	26.22	23.67	21.91	20.65	19.71
20.0	92.64	50.90	37.17	30.44	26.50	23.96	22.21	20.96	20.03
21	93.12	51.39	37.68	30.97	27.06	24.54	22.82	21.59	20.68
22	93.60	51.88	38.20	31.51	27.62	25.13	23.43	22.21	21.34
23	94.08	52.38	38.71	32.06	28.20	25.73	24.05	22.87	22.00
24	94.56	52.88	39.24	32.61	28.77	26.33	24.68	23.52	22.68
25	95.05	53.38	39.76	33.16	29.36	26.94	25.32	24.18	23.36

* The last payment(s) may be less than the amount indicated.

Table 2. Proportion of total annual payments that are interest when payments are monthly

3 Year Loan

Interest rate	Year 1	Year 2	Year 3
10	.22	.14	.05
12	.26	.17	.06
14	.30	.19	.07
16	.33	.22	.08
18	.36	.24	.09
20	.39	.26	.10

Proportion of total annual payments that are interest when payments are monthly

4 Year Loan

Interest rate	Year 1	Year 2	Year 3	Year 4
10	.30	.22	.14	.05
12	.34	.26	.17	.06
14	.39	.30	.19	.07
16	.43	.33	.22	.08
18	.47	.36	.24	.09
20	.50	.39	.26	.10

Proportion of total annual payments that are interest when payments are monthly

5 Year Loan

Interest rate	Year 1	Year 2	Year 3	Year 4	Year 5
10	.36	.30	.22	.14	.05
12	.42	.34	.26	.17	.06
14	.47	.39	.30	.19	.07
16	.51	.43	.33	.22	.08
18	.56	.47	.36	.24	.09
20	.59	.50	.39	.26	.10

Proportion of total annual payments that are interest when payments are monthly

6 Year Loan

Interest rate	Year 1	2	3	4	5	6
10	.42	.36	.30	.22	.14	.05
12	.48	.42	.34	.26	.17	.06
14	.54	.47	.39	.30	.19	.07
16	.59	.51	.43	.33	.22	.08
18	.63	.56	.47	.36	.24	.09
20	.67	.59	.50	.39	.26	.10

Proportion of total annual payments that are interest when payments are monthly

7 Year Loan

Interest rate	Year 1	2	3	4	5	6	7
10	.48	.42	.36	.30	.22	.14	.05
12	.54	.48	.42	.34	.26	.17	.06
14	.60	.54	.47	.39	.30	.19	.07
16	.65	.59	.51	.43	.33	.22	.08
18	.69	.63	.56	.47	.36	.24	.09
20	.73	.67	.59	.50	.39	.26	.10

Table 3.

ANNUAL DEPRECIATION BY CULLING RATE AND COW VALUE

Cull Cow Value	Year 1	2	3	4	5
(% of price)	Depreciation as proportion of purchase price[a/]				
		20% culling rate:			
25	.27	.25	.16	.08	-1.0
30	.26	.24	.15	.07	-2.0
35	.25	.23	.14	.06	-3.0
40	.24	.22	.13	.05	-4.0
45	.23	.21	.12	.04	-5.0
		25% culling rate:			
25	.30	.26	.15	.04	
30	.29	.24	.14	.03	
35	.28	.23	.12	.02	
40	.26	.22	.11	.01	
45	.25	.21	.10	-.01	
		30% culling rate:			
25	.33	.26	.14	.02	
30	.32	.25	.12	.01	
35	.30	.23	.11	.01	
40	.29	.22	.09	.00	
45	.27	.20	.08	.00	
		33 1/3% culling rate:			
25	.35	.27	.13		
30	.34	.25	.11		
35	.32	.23	.10		
40	.30	.22	.08		
45	.29	.20	.06		

a/ Using regular ACRS depreciation (15, 22, 21, 21, 21)

Table 4.
Present Value of $1[1]
$(1 + r)^{-n}$

Year n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%
1	.99	.98	.97	.96	.95	.94	.93	.93	.92	.91	.90	.89	.89	.88
2	.98	.96	.94	.92	.91	.89	.87	.86	.84	.83	.81	.80	.78	.77
3	.97	.94	.92	.89	.86	.84	.82	.79	.77	.75	.73	.71	.69	.68
4	.96	.92	.89	.85	.82	.79	.76	.74	.71	.68	.66	.64	.61	.59
5	.95	.91	.86	.82	.78	.75	.71	.68	.65	.62	.59	.57	.54	.52
6	.94	.89	.84	.79	.75	.71	.67	.63	.60	.56	.53	.51	.48	.46
7	.93	.87	.81	.76	.71	.67	.62	.58	.55	.51	.48	.45	.43	.40
8	.92	.85	.79	.73	.68	.63	.58	.54	.50	.47	.43	.40	.38	.35
9	.91	.84	.77	.70	.64	.59	.54	.50	.46	.42	.39	.36	.33	.31
10	.91	.82	.74	.68	.61	.56	.51	.46	.42	.39	.35	.32	.29	.27

Year n	15%	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%
1	.87	.86	.85	.85	.84	.83	.83	.82	.81	.81	.80	.79	.79	.78
2	.76	.74	.73	.72	.71	.69	.68	.67	.66	.65	.64	.63	.62	.61
3	.66	.64	.62	.61	.59	.58	.56	.55	.54	.52	.51	.50	.49	.48
4	57	.55	.53	.51	.50	.48	.47	.45	.44	.42	.41	.40	.38	.37
5	.50	.48	.46	.44	.42	.40	.39	.37	.36	.34	.33	.31	.30	.29
6	.43	.41	.39	.37	.35	.33	.32	.30	.29	.28	.26	.25	.24	.23
7	.38	.35	.33	.31	.30	.28	.26	.25	.23	.22	.21	.20	.19	.18
8	.33	.31	.28	.27	.25	.23	.22	.20	.19	.18	.17	.16	.15	.14
9	.28	.26	.24	.23	.21	.19	.18	.17	.16	.14	.13	.12	.12	.11
10	.25	.23	.21	.19	.18	.16	.15	.14	.13	.12	.11	.10	.09	.08

Table 5.

Present Value of $1 Received Annually at the End of Each Year for n Years[1]

$$\frac{1 - (1 + r)^{-n}}{r}$$

Year n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%
1	.99	.98	.97	.96	.95	.94	.93	.93	.92	.91	.90
2	1.97	1.94	1.91	1.89	1.86	1.83	1.81	1.78	1.76	1.74	1.71
3	2.94	2.88	2.83	2.78	2.72	2.67	2.62	2.58	2.53	2.49	2.44
4	3.90	3.81	3.72	3.63	3.55	3.47	3.39	3.31	3.24	3.17	3.10
5	4.85	4.71	4.58	4.45	4.33	4.21	4.10	3.99	3.89	3.79	3.70
6	5.80	5.60	5.42	5.24	5.08	4.92	4.77	4.62	4.49	4.36	4.23
7	6.73	6.47	6.23	6.00	5.79	5.58	5.39	5.21	5.03	4.87	4.71
8	7.65	7.33	7.02	6.73	6.46	6.21	5.97	5.75	5.53	5.33	5.15
9	8.57	8.16	7.79	7.44	7.11	6.80	6.52	6.25	6.00	5.76	5.54
10	9.47	8.98	8.53	8.11	7.72	7.36	7.02	6.71	6.42	6.14	8.89

Year n	12%	13%	14%	15%	16%	17%	18%	19%	20%	21%
1	.89	.89	.88	.87	.86	.85	.85	.84	.83	.83
2	1.69	1.67	1.65	1.63	1.61	1.59	1.57	1.55	1.53	1.51
3	2.40	2.36	2.32	2.28	2.25	2.21	2.17	2.14	2.11	2.07
4	3.04	2.97	2.91	2.86	2.80	2.74	2.69	2.64	2.59	2.54
5	3.60	3.52	3.43	3.35	3.27	3.20	3.13	3.06	2.99	2.93
6	4.11	4.00	3.89	3.78	3.68	3.59	3.50	3.41	3.33	3.24
7	4.56	4.42	4.29	4.16	4.04	3.92	3.81	3.71	3.60	3.51
8	4.97	4.80	4.64	4.49	4.34	4.21	4.08	3.95	3.84	3.73
9	5.33	5.13	4.95	4.77	4.61	4.45	4.30	4.16	4.03	3.91
10	5.65	5.43	5.22	5.02	4.83	4.66	4.49	4.34	4.19	4.05