Technical Bulletin 224

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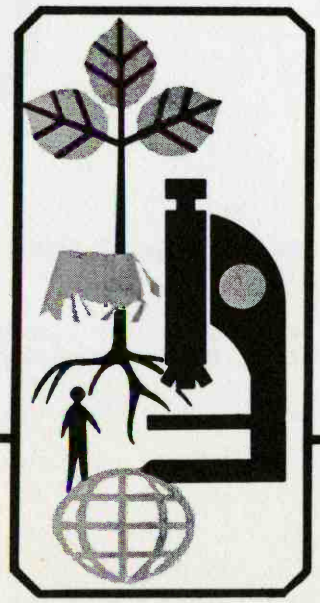

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THE ECONOMICS OF OWNING, LEASING, RENTING, OR CUSTOM-HIRING SELECTED FARM MACHINES IN ARIZONA

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INTRODUCTION

Financial success for today's commercial farm business is highly dependent on how effectively farm machinery resources are managed. This dependency can be characterized by noting the capital allocations currently made to machinery. Nationally, there was a $39.0 billion investment in farm machinery and vehicles in 1973, representing about 10 percent of the investment in all agricultural assets [USDA, 1973]. Continuing purchases of larger, more productive, and more expensive machinery have contributed heavily to a long-standing, upward trend in machinery investment. Over the past five years the U.S. investment in farm machinery has increased by $9.5 billion [USDA, 1973].

In addition to representing an important component of the U.S. agricultural capital stock, farm machinery accounts for a large proportion of U.S. aggregate and individual farm capital flows. During the 1965-1971 period, machinery-related outlays exceeded those for any other asset and accounted for about 42 percent of the total U.S. agricultural capital flow. This proportion is projected to increase to around 46 percent by 1975-1979 [Melichar, 1973]. In Arizona, 1974 budgets for several Yuma area field crops indicate that machinery fixed and variable costs represent between 30 and 40 percent of total per-acre production costs [Hathorn, et al., 1974]. The magnitude of these machinery investments and costs suggest that increased effectiveness in machinery management offers a major opportunity for improving farm business performance.

The Problem

While farmers are confronted with numerous machinery management problems, one of the most important and difficult is selection of the optimal method of controlling machinery resources. Traditionally, farmers have owned most of their machinery; however, several recent economic developments have encouraged greater use of leased, rented, and custom-hired machinery. Developments of particular importance are the increasing size and associated indivisibility of machinery investments, heavier demands for capital in other areas of the farm business, and a high rate of machinery obsolescence. The economic impact of these forces on the farm firm can in some cases at least be blunted by hiring rather than owning machinery.

Paralleling the growing demand for hired machinery has been an increased supply of these services [Irwin, 1972]. In Arizona and the U.S., several machinery dealers and manufacturers currently have lease, lease-buy, and rent programs for many types of farm machinery. Also, custom-hired machinery is widely available from specialized custom operators and from farmers with excess machinery capacity. Consequently, Arizona farmers today often have several alternatives to ownership to consider in acquiring their machinery.

Selecting the best method of acquiring machinery poses a complex economic problem for the farm manager. Sound decision-making requires the identification and careful consideration of numerous economic factors. It is necessary, for example, to consider such variables as the following: (1) sources and costs of equity and debt capital, (2) interest costs implicit in lease, rent, and custom-hire fees, (3) size of the business, (4) size of the income tax shield, (5) relationship between access to additional debt capital and the method of financing machinery, and (6) distribution over time of depreciation, and interest, lease, rent, custom-hire, and principal payments. The identification of the optimal machinery control alternative, as determined by these variables and others, is the problem addressed in this study.

Study Objectives

The primary objective of the study was to develop information that will assist other researchers, individuals financing machinery acquisition, and farmers in identifying the optimum method of controlling farm machinery in Arizona. Control alternatives considered were ownership (credit and cash purchase), lease-buy, lease, rent, and custom-hire. These alternatives are evaluated for the following machines: (1) 100-horsepower wheel tractor, (2) 165-horsepower, four wheel-drive tractor, (3) cotton picker, (4) combine, (5) hay baler, (6) field hay cuber, (7) self-propelled windrower, and (8) self-propelled bale wagon.

The more specific study objectives were as follows:

1. To identify the policies under which custom-hired, leased, and rented machinery are obtained.
2. To develop analytical models capable of comparing competing machinery control alternatives.
3. To identify optimal control alternatives for eight major farm machines under various business circumstances.
4. To investigate the impact of machine use, productivity of capital, marginal income tax rates, and depreciation policies on economic comparisons of machinery control alternatives.

Methodology

The study is based on data obtained from surveys in a five county area (i.e., Cochise, Maricopa, Pima, Pinal, and Yuma Counties) in Southern and Central Arizona. This area was selected because it dominates agricultural production in Arizona, e.g., 88 percent of all cash receipts from 1973 sales of Arizona farm products stemmed from this region [Arizona Crop and Livestock Reporting Service, 1974].

Personal interviews were conducted with 12 machinery dealers during July and August, 1973. The sample included those dealers known to be heavily involved in machinery leasing and renting. Income generated by these activities accounted for an average of 19 percent of the total income realized by the 12 dealers. Data obtained from the dealers included: (1) type and volume of leased/rented machinery, (2) renting/leasing rates and policies, (3) experiences with and outlook for renting/leasing activities, (4) attitudes regarding farmer advantages in renting and leasing machinery, and (5) machinery list prices.

In July, 1973 personal interviews of agricultural loan representatives from three major banks and the Cooperative Farm Credit System were conducted. Information on machinery loan policies (e.g., down payments, interest rates, repayment arrangements) was collected from these institutions.

Custom-hire rates and policies were obtained via a March, 1974 mail survey of 800 randomly selected farmers. From this survey, 143 responses were received, 84 of which indicated custom work had been performed or hired during 1973.1/

The criteria selected for comparing machinery control alternatives was the present value of after-tax costs. More specifically, the alternative whose costs, defined in this manner, are the lowest was considered optimal. Comparisons of costs on an after-tax basis were necessary since the tax treatment of control costs differs, depending on how machinery is acquired.

It was assumed that the same machinery was obtained, regardless of the control alternative selected. Consequently, machinery returns are not affected by the control decision and need not be considered. It follows that the appropriate decision criteria for the farmer attempting to maximize the present value of his business is selection of the control alternative whose present value of costs is lowest.

A present value analysis was used due to differences between control alternatives in the distribution of cash outflows over time. Farmers usually have alternative productive uses for capital; therefore, money has a value that is related to time. Specifically, expenses incurred at future points in time are less costly than those incurred immediately. Delayed expenditures means that during the interim period these funds can either be profitably invested or interest costs on borrowed funds reduced. Consequently, future costs must be discounted to reflect these additional earnings.

Machinery control costs were discounted in this study at a rate equal to the assumed after-tax return available to the farm business from alternative investments.2/ The improved accuracy resulting from present value comparisons was felt to more than offset the added computational difficulties inherent with using discounted cash flow techniques. This procedure represents a major departure from the partial budgeting approach used in other studies (e.g., Corty and Nelson, 1970; Dennistoun, et al., 1967; Williamon, 1972).

Models were designed to identify the present value of after-tax costs for each control alternative.3/ In order to calculate costs with the models, it was necessary to adopt specific assumptions for several variables. Yet many of these variables change from business to business; moreover, these changes may have a significant impact on the least-cost solution. To overcome this difficulty and add more flexibility to the study, a sensitivity analysis with respect to changes in the discount rate, marginal tax rate, and machine use was conducted. A computer routine was developed and utilized to facilitate cost computations.

Definitions

There is considerable inconsistency in the literature and the farm machinery industry regarding the distinction between leasing and renting. To avoid confusion, the key features of each arrangement, as identified by the survey of machinery dealers and the literature [Hopkin, et al., 1973; Hunt and Shaudys, 1969; and Wilson, 1968] are briefly discussed below.

A lease is a long-term contractual agreement between the lessor (e.g., machinery dealer or bank) and the lessee (farmer) whereby the lessee acquires

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1/ For a summary of survey results see Willett, G.S., et al., "Custom Rates for Arizona Farm Machinery Hire," Arizona Agri-File, Q-306, Cooperative Extension Service, University of Arizona.

2/ Additional detail on discounting techniques is available in most financial management texts; for example, see Hopkin, et al. (1973), Aplin and Casler (1973), and Weston and Brigham (1972).

3/ A mathematical formulation of the models is presented in Appendix B.

possession of the machinery in exchange for an agreed upon payment. The length of the lease period is at least one year and may run as long as eight years; however, most contracts are for two to four years. Other features are:

1. Ownership of the machinery remains with the lessor. The lessee merely acquires the right of temporary possession.
2. One or more lease payments are due at the time the lessee initially obtains possession with subsequent payments made at monthly, quarterly, semi-annual, or annual intervals.
3. The lessor may or may not recognize a salvage value in calculating lease payments. If a salvage value is not recognized, lease fees will be set high enough to cover the machine's list price, various lessor carrying costs, and ensure the lessor a return on his investment. This full payback arrangement is technically referred to as a financial lease. Where a salvage value is recognized, an adjustment may be made at the conclusion of the lease period in the event the salvage value differs from that used to calculate lease payments.
4. Often the lease is noncancellable, and if cancelled, a substantial penalty may be imposed (e.g., payment of all or a designated percent of remaining lease fees).
5. Typically, the lessee is responsible for property taxes, insurance, and repairs not covered by the warranty.
6. Most lease contracts are written with lease-buy options, which means the lessee can exercise an option to buy the machinery either during or at the conclusion of the lease period. Several different schemes are used to establish the purchase price (e.g., list price minus designated percent of lease payments, estimated market value at time contract is terminated).

A rental agreement, in contrast to leasing, is a short-term arrangement covering less than one year. Contract periods vary from one day to several months. Rental fees are based on the length of time the machinery is rented. Consequently, lease costs do not vary with annual machine use as do rental costs. Longer-term (i.e., monthly) rentals often require that the farmer pay the various ownership costs. All operating costs are normally paid by the farmer, regardless of the length of the rental contract. Longer-term rental contracts frequently have a purchase option.

Custom-hiring is similar to renting in that costs are dependent on the amount of work performed by the machinery. The key difference is that custom-hired machinery includes an operator. Additionally, the custom operator incurs ownership and operating costs and passes them on to the farmer via the custom fee.

OWNING VERSUS HIRING FARM MACHINERY: BASIC ECONOMIC ARGUMENTS[4/]

Financial Consideration

Probably the most commonly stated advantage with machinery hiring is that relative to ownership it frees working capital.[5/] This argument is based on the premise that cash outflows during the initial phases of the control period are less with hired than with owned machinery. Even though this study generally substantiates this argument, some qualifications should be noted. First, it will not be an advantage where there are no profitable alternative uses to which the freed capital can be diverted; conversely, the more profitable the available investment opportunities, the more significant the advantage. Second, if the freed capital materializes in the form of unutilized borrowing capacity, the advantage is primarily a stronger risk bearing position, rather than improved profitability. Third, it is not apparent that in all cases hiring has a cash flow advantage. For example, the survey of lending institutions indicated considerable variation in the size of required machinery down payments, i.e., 10-40 percent. A machine that is leased for four years under a full payback arrangement requiring level annual payments and the first installment in advance would necessitate an initial outlay equal to at least 25 percent of the machine's list price. Therefore, it is conceivable that down payments may be less than initial machine hire payments. The issue is further complicated by tax considerations (these are discussed later).

Another related argument commonly advanced in favor of machine hiring is that greater financing is obtained. Farmers with severe capital shortages may not have the equity capital needed for either a cash purchase or a down payment. They may, however, have the funds needed to make smaller, initial machine hire payments. Assuming the machinery is profitably used, subsequent payments can then be financed directly out of future machinery earnings. Consequently, financially weak farmers can profitably use machinery that otherwise may not be available.

Lessors will normally insist, however, that the potential lessee demonstrate an ability to honor financial commitments before they will rent or lease machinery. Eleven of the 12 surveyed dealers required an explicit indication of financial integrity, commonly a recent financial statement. The exact level of financial strength required was not clearly specified in most cases. One dealer had a minimum net worth requirement of $50,000. All but two lessors felt that most of their leasing/renting customers could obtain the credit needed to buy the machinery. This suggests that farmers primarily view leasing and renting as an alternative method of financing machinery services and that they prefer to use more conventional sources of credit (i.e., banks and Production Credit Associations) for other operating needs.

While farmers may be able to obtain greater leverage by hiring machinery, e.g., a given amount of capital (the machine) is received with a lower initial equity capital investment, this advantage must be weighed against the strong likelihood of greater financing costs. Lease and rent payments will contain an interest cost commensurate with the financing extended and risk assumed by the lessor. While studies in other states have found lease interest costs to be quite high relative to those charged on funds borrowed from traditional sources, [Dennistoun, et al., 1967; Willett and Berge, 1972] interest costs identified on some leases in this study were quite competitive with rates charged on machinery loans at that time (9-10 percent).[6/] However, there were also leases whose interest rates ran as high as 13 percent. An additional indication that leasing/renting may be a high cost source of financing is offered by the comment of nine of the 12 surveyed dealers that the return on their investment in leased/rented machinery exceeded that realized from machinery sales. Thus, it is possible that the additional financing costs associated with greater financing may more than offset the advantages of a more desirable timing of cash outlays.

The so-called "balance sheet effect" is another financial advantage often claimed for leasing and renting [Van Horne, 1971]. According to this argument, substituting a lease for a debt financed purchase will improve the firm's balance sheet, thus permitting access to greater amounts of debt capital. For example, by substituting a $10,000 lease for a note of the same size, $10,000 is eliminated from both the asset and liability side of the balance sheet. The net worth remains unchanged, but the liability to net worth ratio decreases. Also, the asset turnover ratio and the rate of return to total capi-

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4/ The discussion in this section draws from numerous sources, including the following: 1. Greisinger (1955); 2. Irwin and Smith (1972); 3. McLean (1963); 4. Thulin (1964); 5. Vancil (1963); and 6. Williamon (1972).

5/ Unless otherwise indicated, machinery hiring refers to leasing, renting and custom-hiring.

6/ The interest rate implicit in a full-payback lease can be derived by the following formula: $i = (2NF)/(P(M+1))$; where N = number of payments per year, F = total finance charges (i.e., total lease payments - list price), P = principal borrowed (i.e., list price - prepaid lease fees), M = total number of lease payments over the control period.

tal investment will improve.

When representatives of the surveyed financial institutions were asked if leasing/renting would increase the farm's debt carrying capacity, all replied that it would not. Basically, their reasons were as follows: (1) most lease contracts are irrevocable, therefore, the lessee is obligated to make a series of future payments in much the same manner as with a debt financed purchase, (2) cash flow projections will reveal future lease payments and these projections are instrumental in determining the availability of debt capital, and (3) financial statements prepared by Certified Public Accountants have contractual lease payments footnoted. To the extent these comments can be generalized to other creditors, it appears that the "balance sheet effect" argument is a weak one. Moreover, as agricultural lenders become more familiar with leasing/renting activities, it is likely that the argument will become even less valid.

Income Tax Considerations

Nine of the 12 machinery dealers indicated that leasing/renting yields significant farmer tax advantages. Yet, the tax statutes are not intended to discriminate between leased and owned machinery [Smith, 1968]. To determine whether the tax laws are, in fact, neutral, it is necessary to compare both the size and timing of tax savings realized from hired and owned machinery.

Fees paid for hired machinery are tax deductible, providing the machinery is used in the business [Department of Treasury, 1974]. An exception to this rule applies when a lease-buy agreement has been interpreted by the Internal Revenue Service to be a conditional sale. When the lessee obtains ownership upon the expiration of the lease for either a nominal price or for a price that appears to have been related to the sum of lease payments, there is a strong likelihood that the lease will be classified as a conditional sale [O'Byrne and Keast, 1970]. If classified as such, the lease payments, to the extent they do not represent interest or other charges, must be capitalized and depreciated [Department of Treasury, 1974].

Tax neutrality with respect to the size of tax credits is highly dependent on the equality of machine hire payments and depreciation claimed over the control period. Depreciation on purchased machinery equals the difference between the machine's cost basis and salvage value. Assuming a salvage value is designated on owned machinery, a full-payback lease implies that total lease payments will exceed depreciation. Total tax deductible expenses in the case of renting and custom-hiring depend on machine use.

Investment credit laws currently in effect may also be important in determining the relative size of tax shields. Investment credit (which is deducted dollar for dollar from the federal income tax liability) can be claimed on qualified purchased property with a useful life of at least three years. Most farm machinery purchases entitle farmers to receive investment credit. With leased machinery, the lessor (not the lessee) is the owner and thus is legally entitled to receive the credit. Lessors may, however, elect to pass the credit along to the lessee.

Since it is the present value of the tax shield that is important, the timing of tax savings must also be considered. More specifically, the sooner a tax saving is realized the better, since savings can be invested in an alternative profitable use. Those who argue that leasing has a tax advantage generally feel that this advantage is primarily due to timing benefits (e.g., Greisinger, 1955; Harrel, 1968; McLean, 1963). The timing benefit materializes when machine hire payments exceed depreciation and interest deductions during the early phases of the control period. The possibility of a tax timing advantage for machine hiring is enhanced when machinery is traded frequently, thereby preventing full use of accelerated depreciation methods.7/ 8/

Other Considerations

One of the most serious drawbacks of hired machinery is the loss of residual value. When machinery is leased, rented, or custom-hired, the farmer has no equity interest in the machinery at the end of the control period. On the other hand, by purchasing the machinery farmers recapture a part of their investment through either an outright sale or from credits received when the used machinery is traded for a replacement. Increased activity in the used machinery market in recent years has resulted in attractive used machinery prices, thus the residual value loss can be significant. However, this disadvantage is at least partially offset when a salvage value is recognized in establishing lease fees.

Because of the trend toward larger, higher capacity machinery and inflation, the indivisibility of machinery investments has increased over time. This has made it increasingly difficult to purchase machinery that provides the precise quantity of services required for optimum economic use. The problem is especially acute for smaller businesses where

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7/ To use 20 percent additional first year depreciation, machinery must have a useful life of at least six years; also, use of double declining balance and sum of the years-digits methods requires a useful life of three years or more [Department of Treasury, 1974].

8/ A more detailed analysis of tax differences between leased and owned farm machinery is presented in Willett and Penland (1974).

machine use is not great enough to justify large capital investments. These indivisibility problems can be partially overcome by hiring machinery. Through hiring, farmers can obtain machinery for only the time period needed to perform a specific job(s) without a large capital outlay.

The size of the farm business will also be an important factor in machinery control cost comparisons. Since total custom-hire and rent costs often vary directly with the amount of work performed, costs per unit of work remain relatively constant for these two alternatives. Total control costs for purchase, lease, and lease-buy alternatives will not vary with the amount of work performed; thus, per unit costs decrease with increased use. It follows that these latter alternatives will compare more favorably with custom-hiring and renting as the size of the farm business increases.

It can be argued that machinery hiring provides a form of insurance against the risk of technological obsolescence. The argument is more applicable to renting and custom-hiring than leasing. The former agreements normally cover short periods of time and, therefore, the farmer runs a small risk of making payments on obsolete machinery. A long-term, noncancellable lease provides the lessee with little or no protection against obsolescence. Moreover, it is likely that the cost of any risk borne by the lessor will be reflected in higher lease and rental rates. Since lessors tend to be machinery manufacturers and dealers, these costs are likely quite accurate.

Machinery hiring (except long-term leases) has the advantage of enabling a trial use period. This means that farmers have an opportunity to do an effective job of selecting machinery prior to a large capital outlay.

Operational timeliness is another issue that may have some implications regarding the machinery control problem. By virtue of the complete control inherent with machine ownership, it is possible to get machinery in the field at the optimum time. Also, a high degree of control accompanies long-term leases. Potential losses from not getting farming operations performed on time are generally higher for rented and custom-hired machinery.

Related to the timeliness issue is the argument that machine downtime will be less with leased/rented machinery. According to this argument, the lessor has made a legal commitment to provide machinery services of a specific type for a specific period of time. If the machine breaks down, the lessor is obligated to either make immediate repairs or provide a replacement. When asked about this, Arizona lessors had mixed responses; some indicated downtime is less with leasing/renting, others thought the opposite was the case, and still others felt there was little basis for making a distinction. In all probability, downtime varies more between different dealers/lessors than between methods of control.

Financing machinery with either a lease or an installment loan provides some protection against inflation. The longer-term contractual nature of these agreements means that during an inflationary period future financial commitments are discharged with depreciated dollars. Also, in the event leasing enables a faster tax write-off than is possible with other control alternatives, additional inflationary insurance is provided. Due to their short-term nature, renting and custom-hiring are poor hedges against inflation.

As pointed out earlier, custom-hiring is unique in that an operator commonly accompanies the machine. This will be an important advantage to those businesses with limited, high cost labor. Also, because of the fixed nature of some hired labor costs, it may be necessary, where custom work is not hired, to employ workers during periods when labor is not needed. In addition, operators of custom-hired machines have an opportunity to become specialized and, thus, more efficient in performing machine operations.

Traditionally, many farmers have derived substantial aesthetic benefits from owning and operating the latest in farm machinery. In fact, pride of ownership has often been on a level of importance equivalent to economics in many machinery control decisions. Some farmers, for pride of ownership reasons, will not seriously consider hiring machinery, yet have no reservations about leasing land. This attitude is puzzling in that the advantage more likely lies with owning the asset whose value appreciates (land) and hiring the asset that depreciates in value (machinery). As additional demands are placed on the farmer's sources of capital, he will increasingly realize and appreciate the fact that it is operating, not owning, machinery that is essential to profit making. It is expected that pride of ownership will play a smaller role in future years.

Machinery Dealer Opinions About Leasing/Renting Versus Owning Machinery

Since machinery dealers are the primary source of information farmers have about leased/rented machinery, it is important to know how the dealers view the economics of leased/rented versus purchased machinery. The dealers were asked if they felt leasing/renting has the advantages over ownership suggested by the literature. Dealers responded by indicating strong agreement, agreement, no difference, disagreement, and strong disagreement with a series of statements reflecting specific leasing/renting advantages. These responses indicate the majority of the dealers agree that relative to ownership, leasing/renting frees working capital, provides additional financing, and saves taxes (Table 1). There is also a majority agreement that leasing/renting reduces the risk of obsolescence, helps overcome capital indivisibilities, enables use of more modern machinery, is a higher cost source of financing, and improves operational timeli-

ness. However, the dealers generally do not feel there is a large difference with respect to machine downtime. Responses also indicate that in the dealers' opinion, pride of ownership is not a key factor in machinery lease/rent versus purchase decisions.

TABLE 1. SUMMARY OF LESSOR RESPONSES REGARDING THE ADVANTAGES FARMERS REALIZE BY LEASING AND RENTING RATHER THAN OWNING MACHINERY.

Statement Leasing and Renting:	Responses of 12 Lessors											
	Strongly Agree		Agree		No Difference		Disagree		Strongly Disagree		No Opinion	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Have a tax advantage	3	25.0	6	50.0	1	8.3	1	8.3	-	-	1	8.3
Reduce risk of obsolescence	1	8.3	7	58.3	1	8.3	3	25.0	-	-	-	-
Frees working capital	4	33.3	7	58.3	-	-	-	-	-	-	1	8.3
Reduces machinery downtime	-	-	4	33.3	4	33.3	2	16.7	2	16.7	-	-
Provides additional financing	3	25.0	8	66.7	-	-	1	8.3	-	-	-	-
Helps overcome machinery capital indivisibility	1	8.3	8	66.7	-	-	2	16.7	-	-	1	8.3
Enables use of more modern machinery	2	16.7	7	58.3	1	8.3	2	16.7	-	-	-	-
Improves operational timeliness	1	8.3	6	50.0	1	8.3	3	25.0	1	8.3	-	-
Is a high cost source of funds	-	-	7	58.3	-	-	4	33.3	1	8.3	-	-
Is discouraged for pride of ownership reasons	-	-	4	33.3	-	-	3	25.0	4	33.3	1	8.3

ECONOMIC ANALYSIS OF CONTROL ALTERNATIVES FOR SELECTED FARM MACHINES

Survey data were used to develop several control alternatives for each of eight pieces of commonly used farm machinery. These alternatives were analyzed via computerized models to identify the present value of after-tax costs. The analysis was conducted in two different phases. First, a base analysis was used to develop control costs under business circumstances considered to be typical for Arizona commercial crop farms. A sensitivity analysis investigating the impact of varying key business factors (e.g., discount rate, marginal tax rate, and machine use) on relative control costs was undertaken in the second phase.

Cash flows were projected over assumed control periods and discounted on a monthly basis. The analysis was simplified, where possible, by eliminating all costs that were common to each control alternative. Machinery list prices, down payments, interest rates, and lease, rent, and custom-hire rates and policies are based on the machinery dealer, financial institution, and farmer surveys.

100-Horsepower Wheel Tractor

Base Analysis. Control alternatives analyzed for the 100-horsepower wheel tractor are: (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, and (5) rent. The list price of the tractor is $13,200. If the purchase is financed with credit, a 30 percent down payment is required, and the principal ($9,240) must be repaid in three, equal annual installments. Accumulated interest, calculated at a nine and one-half percent annual rate on the remaining balance, is due with each principal payment.9/ Straight line depreciation is used and investment credit is claimed for the year of purchase (i.e., at the beginning of the second year). A salvage value of $6,428 is realized at the end of four years (the assumed control period).10/

With a lease-buy agreement, the tractor is leased for two years and then purchased for $4,116.56. A lease prepayment of $5,046.36 is required and an equal payment is due at the beginning of the second year. The lessee is responsible for insurance, housing, property taxes, and operating expenses (i.e., fuel, lubricants, repairs, and labor).11/ Thirty percent of the purchase price is paid down and the remainder is borrowed and repaid in two, equal annual payments. The salvage value is the same as indicated earlier, thus a depreciation recapture and capital gain liability is incurred.

If the tractor is leased for four years, four annual payments of $4,043.16 each must be made. The first of these is due at the time of initial possession. The tractor is returned to the lessor at the end of the fourth year.

The same tractor can also be rented on a monthly basis for $660 per month. In the base analysis, rent payments are due at the beginning of each month. It is assumed that the tractor will be used for five months in each of the four years.

Cash flows for the five alternatives are projected in Tables 2-5. To expedite presentation, the projections are summarized on a yearly rather than a monthly basis. The projections assume a 32 percent marginal tax rate (the rate at which one dollar of additional taxable income is taxed).12/

Cash flows for the control alternatives were discounted at a rate of 10 percent. The optimal alternative, under the adopted assumptions, is to lease the first two years and then purchase the tractor (Table 6). The present value of after-tax costs for the lease-buy is $268.00 less than the next best alternative, i.e., a credit purchase. Even though tax savings are substantially larger with leasing, this alternative is considerably more costly than the others. A farmer electing to lease rather than lease-buy will suffer additional costs of $3,684 over the four-year period.

9/ Unless otherwise noted, all debt financed purchases will require: (1) 30 percent down payment, (2) equal annual principal payments, and (3) nine and one-half percent interest calculated on the remaining balance.

10/ All salvage values are derived from American Society of Agricultural Engineers (1972).

11/ These expenses are also the lessee's responsibility for all ensuing lease, rent and lease-buy agreements.

12/ A 32 percent marginal tax rate is also assumed in the base analysis of all the remaining machines. This rate applies to a taxable income of $20,000 - $24,000 for a married couple filing a joint return.

TABLE 2. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A 100-HORSEPOWER TRACTOR.

Year	Purchase	Depreciation	Investment Credit	Total Tax Credit a/	Salvage Value	After-Tax Cost b/
1974	$13,200.00	---	---	---	---	$13,200.00
1975	---	$1,692.90	$308.00	$ 849.73	---	-849.73
1976	---	1,692.90	---	541.73	---	-541.73
1977	---	1,692.90	---	541.73	---	-541.73
1978	---	1,692.90	---	541.73	$6,428.00	-6,969.73
Total	$13,200.00	$6,771.60	$308.00	$2,474.92	$6,428.00	$4,297.08

a/ Equals .32 (marginal tax rate) times depreciation plus investment credit.

b/ Equals purchase price minus total tax credit minus salvage value.

TABLE 3. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A 100-HORSEPOWER WHEEL TRACTOR.

Year	Down Payment or Principal	Interest @ 9-1/2%	Depreciation	Investment Credit	Credit a/	Salvage Value	After-Tax Costs b/
1974	$ 3,960.00	---	---	---	---	---	$3,960.00
1975	3,080.00	$ 877.80	$1,692.90	$308.00	$1,130.62	---	2,827.18
1976	3,080.00	585.20	1,692.90	---	728.99	---	2,936.21
1977	3,080.00	292.60	1,692.90	---	635.36	---	2,736.24
1978	---	---	1,692.90	---	541.73	$6,428.00	-6,969.73
Total	$13,200.00	$1,755.60	$6,771.60	$308.00	$3,036.70	$6,428.00	$5,490.90

a/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest and depreciation) plus investment credit.

b/ Equals down payment or principal plus interest minus total tax credit minus salvage value.

TABLE 4. PROJECTED CASH FLOW FOR LEASE-BUY OF A 100-HORSEPOWER WHEEL TRACTOR.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Depreciation	Total Tax Credit a/	Salvage Value	After-Tax Costs b/
1974	$5,046.36	---	---	---	---	---	$5,046.36
1975	5,046.36	---	---	---	$1,614.84	---	3,431.52
1976	---	$1,234.96	---	---	1,614.84	---	-379.88
1977	---	1,440.80	$273.75	$181.13	145.56	---	1,568.99
1978	---	1,440.80	136.88	181.13	-383.99 c/	$6,428.00	-4,466.33
Total	$10,092.72	$4,116.56	$410.63	$362.26	$3,375.24	$6,428.00	$5,200.66

a/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payments, interest, and depreciation).

b/ Equals lease payment, down payment, or principal plus interest minus total tax credit minus salvage value.

c/ Equals depreciation recapture [.32($362.26)] plus capital gains liability [.16($6,428.00-$4,116.56)] minus tax credit for deductible interest and depreciation.

TABLE 5. PROJECTED CASH FLOW FOR LEASED AND RENTED 100-HORSEPOWER WHEEL TRACTOR.

	Lease					Rent a/		
Year	Lease Payment	Investment Credit	Total Tax Credit b/	After-Tax Costs c/	Year	Rental Payment	Total Tax Credit b/	After-Tax Costs c/
1974	$ 4,043.16	---	---	$ 4,043.16	1974	$ 3,300.00	---	$3,300.00
1975	4,043.16	$308.00	$1,601.81	2,441.35	1975	3,300.00	$1,056.00	2,244.00
1976	4,043.16	---	1,293.81	2,749.35	1976	3,300.00	1,056.00	2,244.00
1977	4,043.16	---	1,293.81	2,749.35	1977	3,300.00	1,056.00	2,244.00
1978	---	---	1,293.81	-1,293.81	1978	---	1,056.00	-1,056.00
Total	$16,172.64	$308.00	$5,483.24	$10,689.40	Total	$13,200.00	$4,224.00	$8,976.00

a/ Assumes tractor is rented five months per year.

b/ Equals .32 (marginal tax rate) times lease and rental payments.

c/ Equals lease or rent payment minus total tax credit.

TABLE 6. PRESENT VALUE OF AFTER-TAX COSTS FOR 100-HORSEPOWER WHEEL TRACTOR, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, AND 32 PERCENT MARGINAL TAX RATE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$ 8,883	$1,967	$6,921
Credit Purchase	8,732	2,436	6,296
Lease-Buy	8,641	2,613	6,028
Lease	14,015	4,303	9,712
Rent (five months)	11,029	3,368	7,661

Sensitivity Analysis. It is conceivable that altering the discount rate, tractor use, marginal tax rate, and depreciation method may affect the cost rankings noted in the base analysis. Additional analysis was performed to determine the impact of varying these four factors.

Figure 1 indicates the impact of varying the discount rate from zero to 20 percent with tractor use at three, five, and seven months. In addition, both straight line (SL) and double declining balance (DDB) depreciation methods are used. The latter method accelerates depreciation to its maximum legal extent for the case at hand.

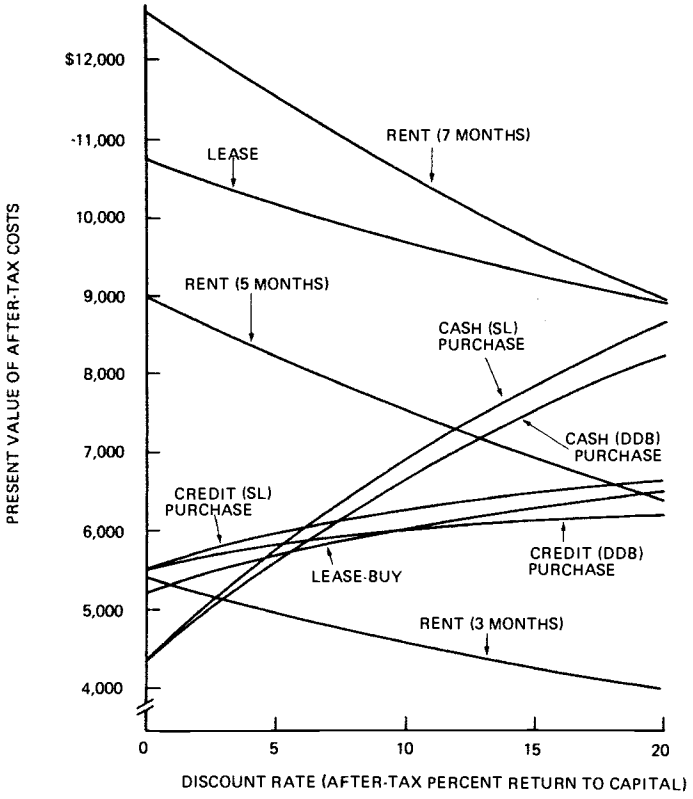

FIGURE 1. PRESENT VALUE OF COSTS FOR A 100 HORSEPOWER WHEEL TRACTOR, SELECTED CONTROL ALTERNATIVES, VARIOUS DISCOUNT RATES, 32 PERCENT MARGINAL TAX RATE, AND STRAIGHT LINE (SL) AND DOUBLE DECLINING BALANCE (DDB) DEPRECIATION METHODS.

As demonstrated in Figure 1, varying these factors can alter control alternative rankings. With tractor use at three months, rent has the lowest cost except at very low discount rates. However, by increasing use to seven months, rent becomes the most expensive method at all discount rates considered. Cash outflows are skewed toward later points in time with the hire alternatives, thus raising the discount rate tends to help these alternatives vis-a-vis ownership. The advantage inherent with accelerated depreciation is also apparent. Moreover, this advantage widens as the discount rate increases, since earlier tax savings can be invested in more profitable uses. 13/ It should also be pointed out that costs for credit and cash purchases are equal at a six and one-half percent discount rate (the assumed after-tax cost of debt capital, i.e., 1 - .32 x 9-1/2 percent). Discount rates above this point implies that the cost of equity capital is greater than for debt capital, thus use of the latter is advantageous.

An increase in the marginal tax rate will benefit those alternatives with the largest tax deductible expenses. For example, total tax deductible expenses for the cash purchase and seven month rent are $3,396 and $8,051, respectively; thus, raising the marginal tax rate by one percent increases tax credits for a cash purchase by $61 and rent by about $143. Figure 2 notes the impact of varying the marginal tax rate from 14 to 70 percent. In general, the rankings are not sensitive to tax rate changes, suggesting that non-tax elements of the cash flow are the most important consideration.

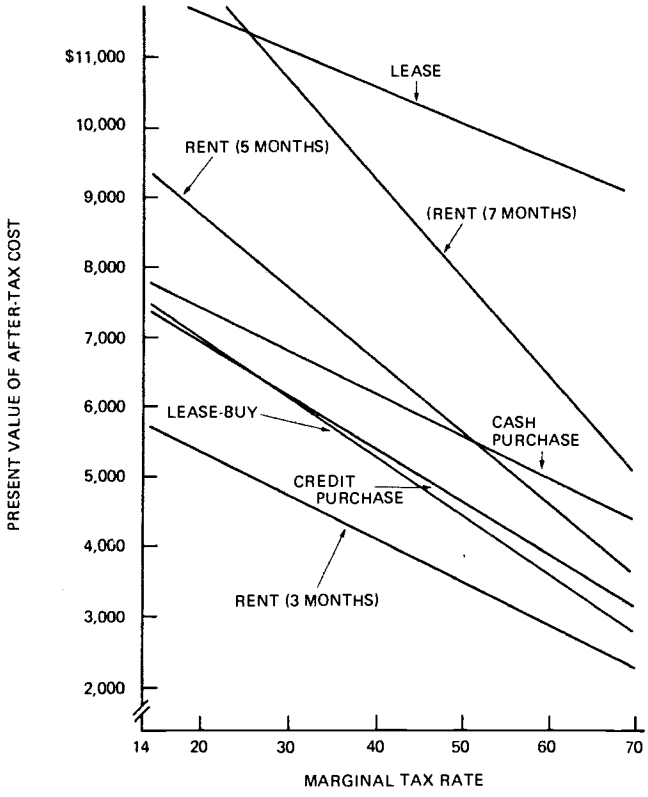

FIGURE 2. PRESENT VALUE OF COSTS FOR A 100 HORSEPOWER WHEEL TRACTOR, SELECTED CONTROL ALTERNATIVES, VARIOUS MARGINAL TAX RATE AND A 10 PERCENT DISCOUNT RATE.

13/ Since straight line depreciation postpones deductible depreciation claims, this method may have an advantage over double declining balance at very high rates of growth in taxable farm income [Willett, Robertson, 1974]. However, the study assumes a zero rate of firm growth and, therefore, accelerated depreciation will always be advantageous.

165-Horsepower, Four-Wheel Drive Tractor

Base Analysis. Control alternatives analyzed for the 165-horsepower tractor are the same as those considered for the 100-horsepower tractor. The tractor can be purchased outright with $26,000 cash or financed by a $7,800 down payment and a $18,200 three year loan. If obtained under a lease-buy agreement, the tractor is leased for two years (lease payments of $4,939.80 per year) and then purchased for $8,108.36. The purchase is made with a 30 percent down payment and a two-year note on the remainder ($5,675.86). A four-year lease requires annual lease payments of $7,963.80 each, with the first paid in advance. Also the tractor can be rented for $1,620 per month. A five month annual rental period is assumed for the base analysis. Cash flows are projected for the five alternatives in Appendix A, Tables 1-4.

The least-cost alternative, assuming a 10 percent discount rate, 32 percent marginal tax rate, and five months of tractor use, is to lease for two years and then buy the tractor (Table 7). Lease-buy has a very slight advantage ($26.00) over the credit purchase but is $7,258 less expensive than the most costly alternative (lease). The cost rankings of the five alternatives are identical to those noted for the 100-horsepower tractor.

TABLE 7. PRESENT VALUE OF AFTER-TAX COSTS FOR 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, AND 32 PERCENT MARGINAL TAX RATE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$17,499	$4,367	$13,132
Credit Purchase	17,198	5,299	11,899
Lease-Buy	17,021	5,148	11,873
Lease	27,605	8,474	19,131
Rent(five months)	26,556	8,066	18,490

Sensitivity Analysis. Varying annual tractor use from three to seven months and the discount rate from zero to 20 percent alters the cost rankings noted for the base analysis (Figure 3). Assuming the tractor is used only three months, a cash purchase is optimal for discount rates up to about six percent; lease-buy is best for discount rates between six and eight percent, and rent is optimal for all higher rates. The advantage shifts to the purchase and lease-buy alternatives when tractor use is increased to seven months.14/

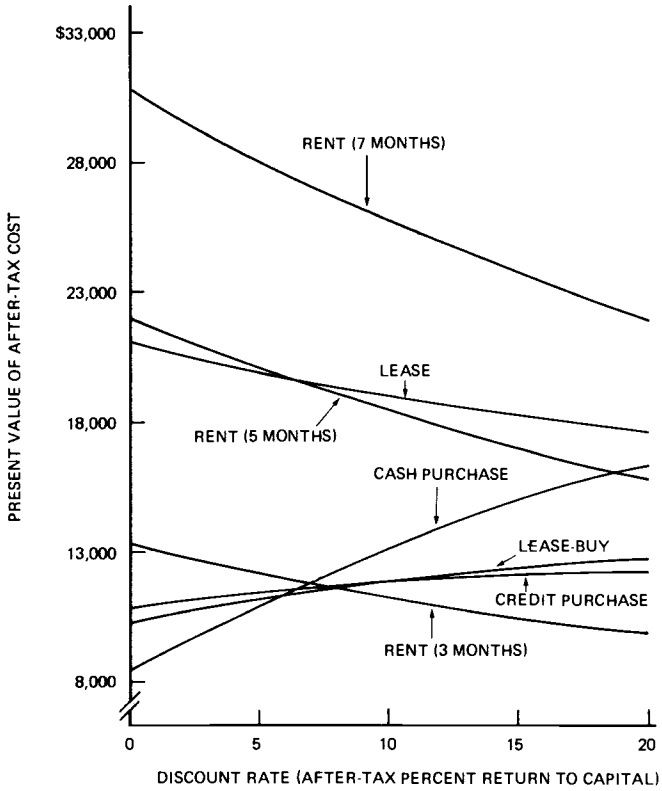

FIGURE 3. PRESENT VALUE OF COSTS FOR A 165 HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR, SELECTED CONTROL ALTERNATIVES, VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

Self-Propelled, Two-Row Cotton Picker

Base Analysis. The surveys indicated that cotton producers may have as many as five alternatives for acquiring a cotton picker, i.e., (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, and (5) custom-hire. If purchased, it is assumed that a popular model picker requires an investment of about $33,000. Producers using credit pay 30 percent down and borrow the remainder ($23,100) on a three-year note. A three-year trade policy is assumed (machine traded at 1,800 hours of total use) with the salvage value of the picker at trade-in equaling $14,652.

14/ The impact of varying the marginal tax rate and depreciation methods will not be presented for the 165-horsepower tractor and other machinery. The analyses indicate that conclusions drawn for the 100 horsepower tractor with respect to the effect of changes in these factors can be generalized to the other machines considered.

A lease-buy arrangement assumes a two-year lease with the purchase option exercised at the end of the second year. Two annual lease payments of $12,619.90 each are required. The purchase price is $10,291.38 and one-half of this is paid down and a one-year note is used for the remaining half. A three-year lease requires three annual lease payments of $11,800.80 each.

The picker may be custom-hired at a rate of $1.75 per hundred-weight of seed cotton. A per-acre yield of 2,353 pounds and 475 pounds of seed cotton is assumed for the first and second pickings, respectively. The custom operator provides trailers, a one-half ton pickup (for shuttling trailers between the field and the gin), and all labor (i.e., picker operator and pickup driver). Average one-way hauling distance is 13 miles.

Since the custom fees reflect the custom operator's fuel, lubrication, repairs, labor, property taxes, housing, and insurance costs, these outlays must be included in the cash flows of the competing control alternatives. Diesel and labor costs are based on prices of 35 cents per gallon and $2.50 per hour, respectively. In the base analysis, costs are developed assuming 300 acres of cotton are picked annually.15/ Relevant cash flows for the five control alternatives are presented in Appendix A, Tables 5-9.

Under the adopted assumptions, custom-hire costs are considerably lower than for any of the other alternatives (Table 8). By custom-hiring rather than using credit to purchase the picker (the second best alternative), cotton producers will save about $11,994 over the three year period, or $13 33 per acre per year in harvesting costs. Cost differences between a cash purchase, credit purchase, and lease-buy are small; leasing, however, is considerably more expensive.

TABLE 8. PRESENT VALUE OF AFTER-TAX COSTS FOR SELF-PROPELLED COTTON PICKER, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 600 HOURS (300 ACRES) OF ANNUAL PICKER USE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$55,602	$16,347	$39,255
Credit Purchase	55,221	17,530	37,691
Lease-Buy	54,939	16,891	38,048
Lease	65,454	20,312	45,142
Custom-Hire	37,320	11,623	25,697

15/ The following sources were used in estimating costs: (1) American Society of Agricultural Engineers (1972), (2) Hathorn, et al. (1974), (3) Nelson(1974).

Sensitivity Analysis. Varying the discount rate does not significantly alter the advantage held by custom-hiring (Figure 4). Leasing improves vis-a-vis the other alternatives with increases in the discount rate but remains the most expensive method for all rates considered.

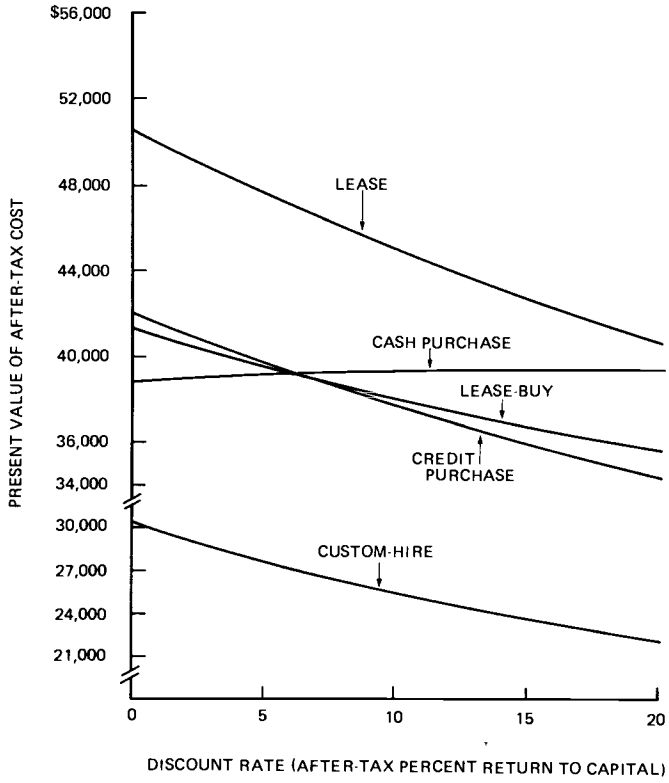

FIGURE 4. PRESENT VALUE OF COSTS FOR A SELF-PROPELLED COTTON PICKER, SELECTED CONTROL ALTERNATIVES, OPERATED 600 HOURS ANNUALLY (300 ACRES), VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

The effect picker use has on per-acre costs is illustrated in Figure 5. Picker use in excess of 300 acres (600 hours) required shortening the control period from three to two years in order to remain within the machine's useful life of 2,000 hours. Since the lease-buy arrangement is a three-year one, it was eliminated from the analysis for use in excess of 300 acres. As indicated in the figure, increasing picker use enables substantial reduction in per-acre costs for all alternatives except custom-hiring. However, these economies are not strong enough to more than offset the advantage held by custom-hire rates of $2.25 or less per hundred-weight of

seed cotton. If the custom rate is $2.50, per-acre costs for custom-hiring and credit purchase are equal at about 285 acres. Break-even use for lease-buy and cash purchase, as compared to custom-hiring, is around 300 and 410 acres, respectively. The most common custom-hire rates ranged from $1.50 to $1.75 per hundred-weight during the 1973 harvest; consequently, it appears that custom-hiring offers considerable cost advantages, providing producers can get the service when it is needed.

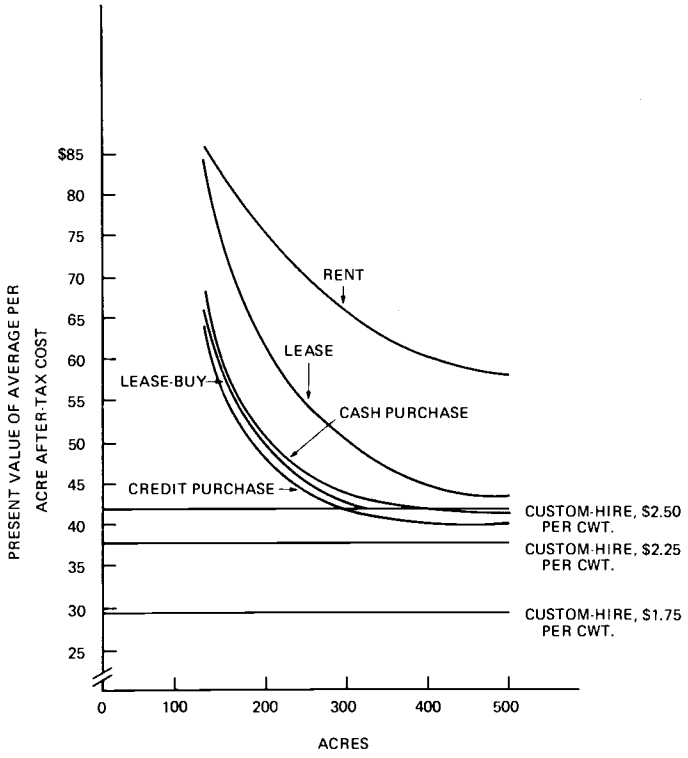

FIGURE 5. PRESENT VALUE OF AVERAGE PER ACRE COST FOR A SELF-PROPELLED COTTON PICKER, SELECTED CONTROL ALTERNATIVES, VARIOUS ACREAGES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

16-Foot Grain Combine

Base Analysis. As many as six different methods may be used by Arizona farmers to acquire a combine, i.e., (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, (5) rent, and (6) custom-hire. The combine considered was a 16-foot model and has a $23,000 list price and a salvage value of $10,212 at the end of three years. A 30 percent down payment and three-year note on the remainder is required for a credit purchase.

Under a lease-buy arrangement, the combine is leased for two years and then purchased for $7,172.73. Lease payments of $8,792.90 each are due at the time of initial possession and at the beginning of the second year. One-half of the investment is financed with equity capital and the remaining half with a one-year note. Three annual payments of $8,224.80 each are necessary if the machine is leased. The combine may also be rented for 25 days each year at $100 per day.

If custom-hired, the rate is $10.00 per acre. The custom operator pays all ownership and operating expenses and transports the crop to storage. To permit valid comparisons, these costs must be included in the cash flow of the other control alternatives. A hauling cost of $2.00 per ton and yields of 34.10 cwt., 40.20 cwt., and 43.70 cwt. for barley, wheat, and grain sorghum, respectively, are assumed. The base analysis assumes a total acreage for these crops of 750 acres. Cash flows for the six control alternatives are projected in Appendix A, Tables 10-15.

Under the outlined assumptions, custom-hire has a clear-cut advantage over the other alternatives (Table 9). Custom costs over the three-year period are only about one-half as large as for the three purchase options. Leasing is the most expensive means of obtaining the combine, exceeding custom-hire costs by $14,648. Rental costs were second lowest but were $3,814 higher than custom-hire outlays.

TABLE 9. PRESENT VALUE OF AFTER-TAX COSTS FOR A 16-FOOT GRAIN COMBINE, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 250 HOURS (750 ACRES) OF ANNUAL MACHINE USE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$29,967	$ 8,517	$21,450
Credit Purchase	29,700	9,341	20,359
Lease-Buy	29,504	8,896	20,608
Lease	36,833	10,799	26,034
Rent	21,036	6,318	14,718
Custom-Hire	15,600	4,696	10,904

Sensitivity Analysis. The impact of varying the discount rate and combine use is noted in Figures 6 and 7, respectively. Custom-hire and rent remain the least-cost alternatives at discount rates below and above the 10 percent rate assumed in the base analysis. Leasing is the most expensive method for all discount rates considered.

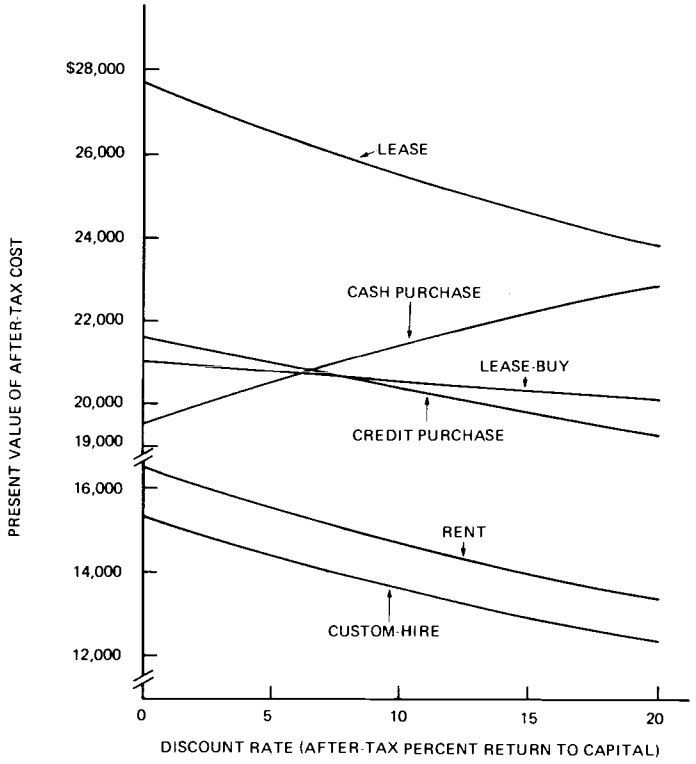

FIGURE 6. PRESENT VALUE OF COSTS FOR A 16 FOOT GRAIN COMBINE, SELECTED CONTROL ALTERNATIVES, OPERATED 250 HOURS ANNUALLY (750 ACRES), VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

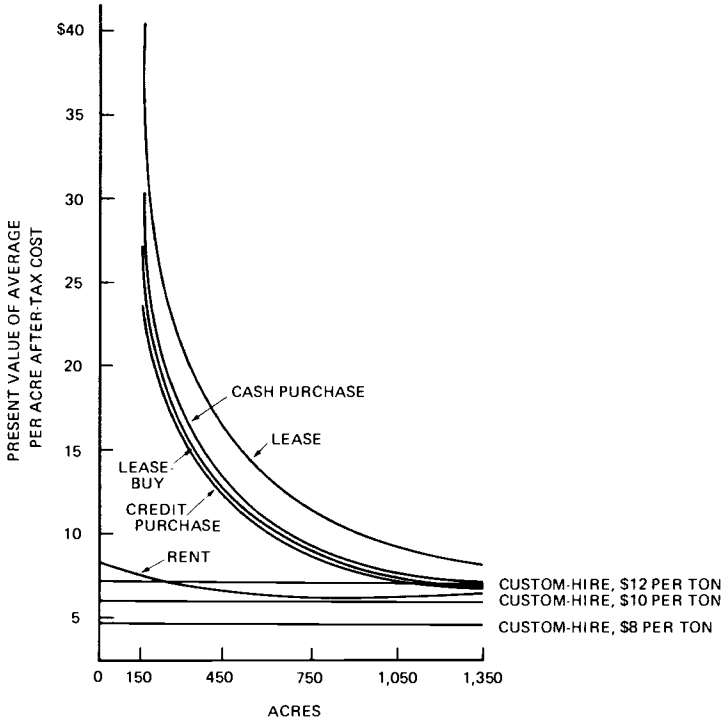

FIGURE 7. PRESENT VALUE OF AVERAGE PER ACRE COSTS FOR A 16 FOOT GRAIN COMBINE, SELECTED CONTROL ALTERNATIVES, VARIOUS ACREAGES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

Increasing combine use from 750 to 1,350 acres does not alter cost rankings from those noted in the base analysis for custom rates of $8.00 and $10.00 per acre. However, if the custom rate is raised to $12.00, per-acre rent and custom-hire costs are equal at about 250 acres with the advantage going to rent at higher acreages and custom-hire at lower ones. Break-even acreages between a credit purchase and custom-hiring and lease-buy and custom-hiring occur at 1,125 and 1,170 acres, respectively.

Engine Drive Hay Baler

Base Analysis. Six control alternatives were analyzed for the baler: (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, (5) rent, and (6) custom-hire. The list price of the baler is $10,120 and a salvage value of $3,927 at the end of three years is assumed. For a credit purchase, 35 percent is paid down, and the remainder is financed with a three-year note.

The baler is leased for two years and then purchased with the lease-buy arrangement. Two lease payments of $3,868.88 each are required, and the purchase price is $3,156.02. Half of the purchase price is paid down, and the remaining half is borrowed and repaid in one year.

If leased for three years, three annual lease payments of $3,618.91 each are necessary. Alternatively, the baler can be rented for $65 per day. Assuming 240 acres of annual use (harvested eight times), the baler must be rented 40 days each year.

Baling may also be custom-hired for $5.00 per ton. A yield of eight tons per acre is assumed. Baler operating and ownership expenses, tractor costs, and wire costs are included in the custom rate; therefore, they must be added to the cash flows of the other five alternatives. Tractor expenses are based on a 100-horsepower tractor used 1,250 hours annually. A wire price of $25 per 6,500 foot roll ($1.88 per ton of hay) is assumed. Cash flow projections for the various control alternatives are presented in Appendix A, Tables 16-21.

As indicated in Table 10, the present value of three-year costs are quite similar for five of the six alternatives. The least-cost alternative is rent; however, only $480 separates this method from the second most expensive alternative (cash purchase). Leasing costs are somewhat higher than the other alternatives, e.g., it costs $2,027 more to lease than rent the baler for three years.

Sensitivity Analysis. Varying the discount rate from zero to twenty percent alters the cost rankings of the six control alternatives (Figure 8). Cash purchase is optimal for rates up to about six percent, credit purchase is best for rates between six and nine and one-half percent, and rent has the advantage at all higher rates. Leasing improves

TABLE 10. PRESENT VALUE OF AFTER-TAX COSTS FOR ENGINE DRIVE HAY BALER, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 275 HOURS (240 ACRES) OF ANNUAL MACHINE USE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$25,087	$7,372	$17,715
Credit Purchase	24,978	7,709	17,269
Lease-Buy	24,883	7,443	17,440
Lease	27,687	8,425	19,262
Rent	24,658	7,423	17,235
Custom-Hire	24,945	7,514	17,431

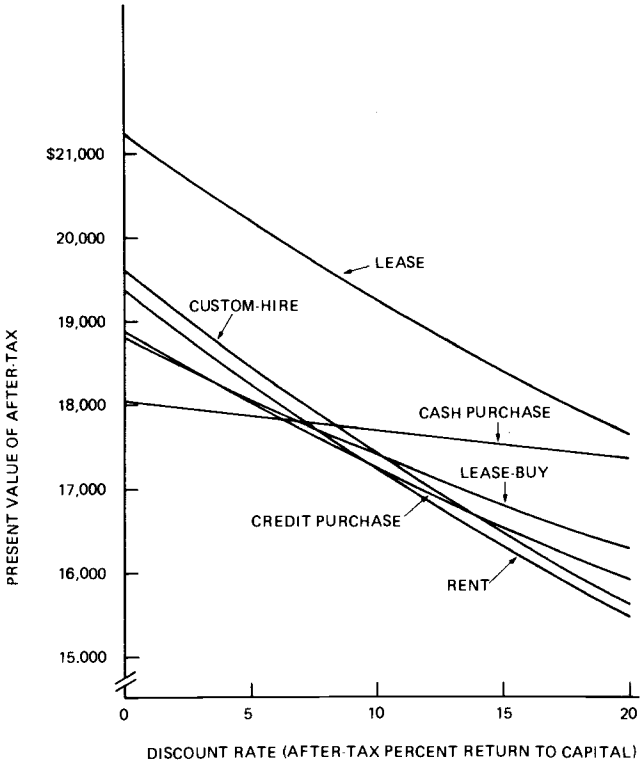

FIGURE 8. PRESENT VALUE OF COSTS FOR AN ENGINE DRIVE HAY BALER, SELECTED CONTROL ALTERNATIVES, OPERATED 275 HOURS ANNUALLY (240 ACRES), VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

vis-a-vis the other alternatives as the discount rate increases but remains the most expensive method at all discount rates considered.

The present value of per-acre costs at different acreages (and a 10 percent discount rate) is indicated in Figure 9. As expected, custom-hire and rent are optimal for smaller acreages but become less attractive as acreage increases. Assuming eight cuttings and an eight-ton yield, breakeven use between: (1) custom-hire and credit purchase is 230 acres, (2) custom-hire and lease-buy is about 240 acres, (3) custom-hire and cash purchase is 250 acres, and (4) custom-hire and lease is 325 acres.

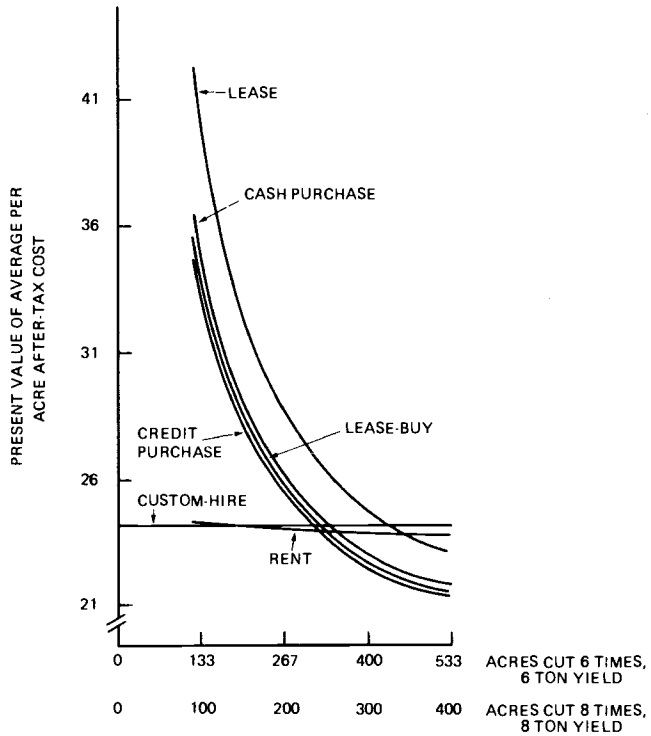

FIGURE 9. PRESENT VALUE OF AVERAGE PER ACRE COSTS FOR AN ENGINE DRIVE HAY BALER, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

14-Foot Self-Propelled Windrower

Base Analysis. Control alternatives analyzed for the windrower are (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, (5) rent, and (6) custom-hire. The windrower used in the analysis has a $13,000 list price and is financed either entirely with equity capital (cash purchase) or a 30 percent down payment and a $9,100 loan. The loan must be repaid in three, equal annual installments. The expected salvage value at the end of four years is $5,096.

The windrower is leased for two years and then purchased for $4,054 with a lease-buy agreement. Two annual lease payments of $4,969.90 each are required. Purchase of the windrower is financed with a 30 percent down payment and two-year loan.

A lease agreement requires four annual lease payments of $3,891.90 each. The windrower can be rented for $65 per day. A 40 day rental period is necessary to cut the acreage assumed for the base analysis, i.e., 140 acres cut eight times. Custom-hiring the windrower costs $4.00 per acre. Tables 22-27 (Appendix A) present the projected cash flows for the six windrower alternatives.

The analysis indicates that custom-hire is the least-cost method of cutting the 140 acres (Table 11). Compared to the next best method (rent) and the most expensive method (lease), savings of $394 and $3,846, respectively, can be realized over the four-year period by custom-hiring the windrower. Cost differences between the three purchase alternatives are quite small, i.e., $617 separates the high (cash purchase) and low cost (credit purchase) methods.

TABLE 11. PRESENT VALUE OF AFTER-TAX COSTS FOR 14-FOOT SELF-PROPELLED WINDROWER, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 225 HOURS (140 ACRES CUT EIGHT TIMES) OF ANNUAL MACHINE USE.

Control Alternatives	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$16,303	$4,518	$11,785
Credit Purchase	16,152	4,984	11,168
Lease-Buy	16,027	4,720	11,307
Lease	20,446	6,251	14,195
Rent	15,357	4,614	10,743
Custom-Hire	14,810	4,461	10,349

Sensitivity Analysis. Raising the discount rate from 10 to 20 percent did not affect the cost rankings derived in the base analysis (Figure 10). With lower discount rates the cash flow timing advantages held by custom-hire and rent are less important; consequently, cash purchase replaces custom-hire as the lease-cost alternative at discount rates below about five and one-half percent. Once again leasing is the most expensive method for all discount rates considered. It is quite competitive with a cash purchase at discount rates around 20 percent, however.

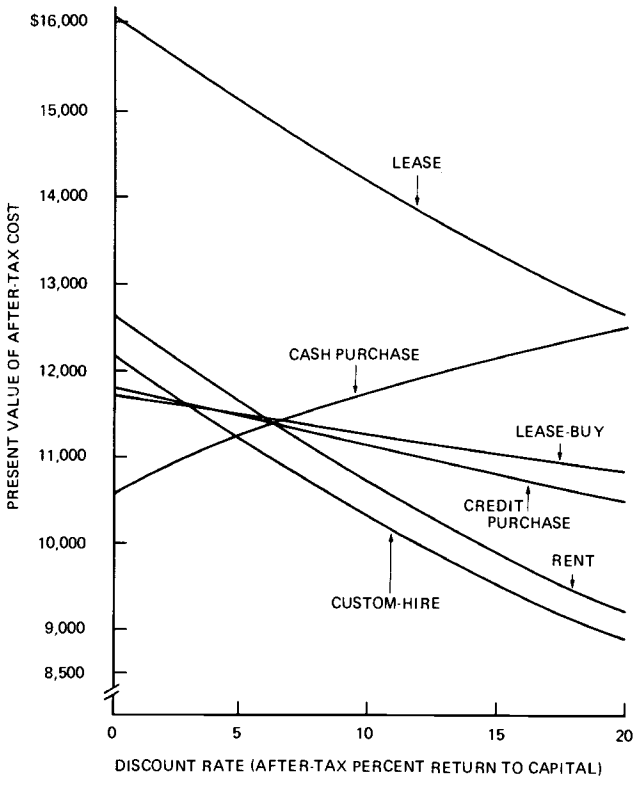

FIGURE 10. PRESENT VALUE OF COSTS FOR A 14 FOOT SELF-PROPELLED WINDROWER, SELECTED CONTROL ALTERNATIVES, OPERATED 225 HOURS ANNUALLY (140 ACRES), VARIOUS DISCOUNT RATES AND A 32 PERCENT MARGINAL TAX RATE.

Assuming a 10 percent discount rate, the present value of per-acre costs of custom-hiring and renting are quite similar for windrower use ranging between 60 and 250 acres (Figure 11). These two alternatives are optimal up to about 150-160 acres cut eight times where the purchase alternatives gain the advantage. Cost differences between cash purchase, credit purchase and lease-buy remain quite narrow and uniform over all acreages considered.

Self-Propelled Bale Wagon

Base Analysis. The surveys indicated that as many as five alternatives could be used to acquire a self-propelled bale wagon. These alternatives are: (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, and (5) custom-hire. The particular wagon for which data was collected has a list price of $18,920. A credit purchase requires a 30 percent down payment and a three-year note on the remainder ($13,244). The wagon is kept for four years and has a market value of $6,982 at the end of this period.

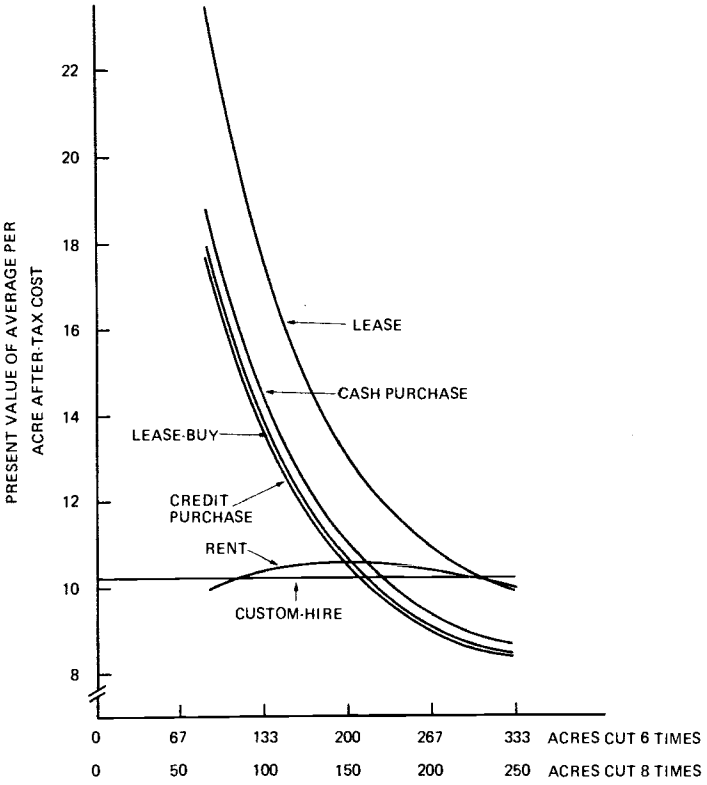

FIGURE 11. PRESENT VALUE OF AVERAGE PER ACRE COSTS FOR A 14 FOOT SELF-PROPELLED WINDROWER, SELECTED CONTROL ALTERNATIVES, VARIOUS ACREAGES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

If the wagon is acquired with a lease-buy agreement, the purchase option is exercised at a cost of $11,432 at the end of the second year. Two annual lease payments of $4,160 each are necessary. The purchase is financed with a 30 percent down payment and a two-year note. A four-year lease requires an annual payment of $4,160 due at the beginning of each year.

The most common custom-hire fee was 12 cents per bale. Assuming a bale weight of 125 pounds, eight ton yield, and 440 acres, the annual custom cost is $6,758.40. The custom operator pays all ownership and operating expenses, thus these outlays must be added to the cash flows of the other alternatives to permit valid comparisons. Operating costs were based on a performance rate of 14 acres per hour, or 250 hours of annual use (440 acres x 8 cuttings/ 14 acres per hour). Projected cash flows for the various control alternatives are presented in Appendix A, Tables 28-32.

As indicated in Table 12, custom-hire is the lease-cost method of acquiring harvesting services. Under the adopted assumptions, farmers custom-hiring a bale wagon will save $460 and $1,978 compared to

TABLE 12. PRESENT VALUE OF AFTER-TAX COSTS FOR SELF-PROPELLED BALE WAGON, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 250 HOURS (440 ACRES) OF ANNUAL MACHINE USE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$24,402	$6,812	$17,590
Credit Purchase	24,183	7,490	16,693
Lease-Buy	22,660	6,588	16,072
Lease	24,505	7,592	16,913
Custom-Hire	22,342	6,730	15,612

the second best (lease-buy) and most expensive (cash purchase) methods, respectively, over the four-year period.

Sensitivity Analysis. The discount rate is an important factor in determining the least-cost alternative. A cash purchase, for example, ranges from the lowest to the highest cost method, depending on the discount rate (Figure 12). Both custom-hire and lease compare more favorably with the other alternatives as the discount rate is increased. Custom-hire is optimal for rates above about five percent, and lease is the most costly at low rates but gains the advantage over a cash and credit purchase at rates of eight and 13 percent, respectively.

With the exception of custom-hiring, the per-acre cost rankings are not affected by varying annual wagon use (Figure 13). Custom-hiring is the least-cost method at small acreages but becomes the most expensive means of wagon control at higher acreages. The break-even acreage (cut eight times) between custom-hiring and the competing alternatives is: (1) lease-buy, 440 acres; (2) credit purchase, 480 acres; (3) lease, 500 acres; and (4) cash purchase, 540 acres.

Field Hay Cuber

Base Analysis. Five control alternatives were considered for the hay cuber, i.e., (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, and (5) custom-hire. If purchased, the cuber and trailing wagon were assumed to require an investment of $45,000. The cuber is assumed to be kept for four years at which time it will have a trade-in

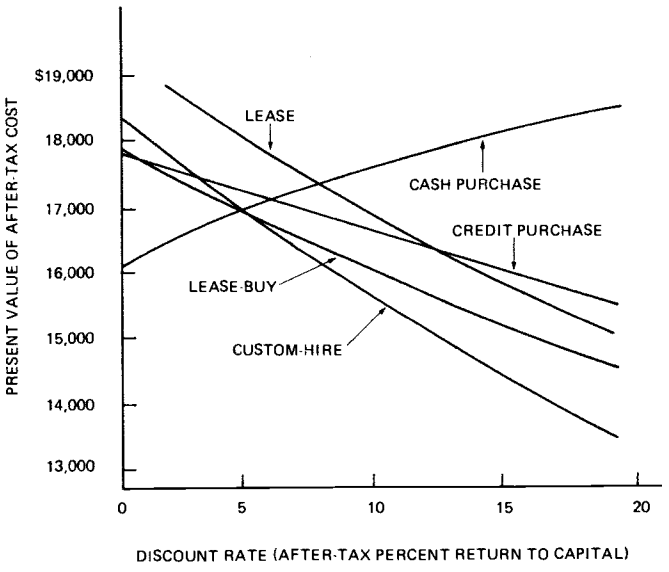

FIGURE 12. PRESENT VALUE OF COSTS FOR A SELF-PROPELLED BALE WAGON, SELECTED CONTROL ALTERNATIVES, OPERATED 250 HOURS ANNUALLY (440 ACRES), VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

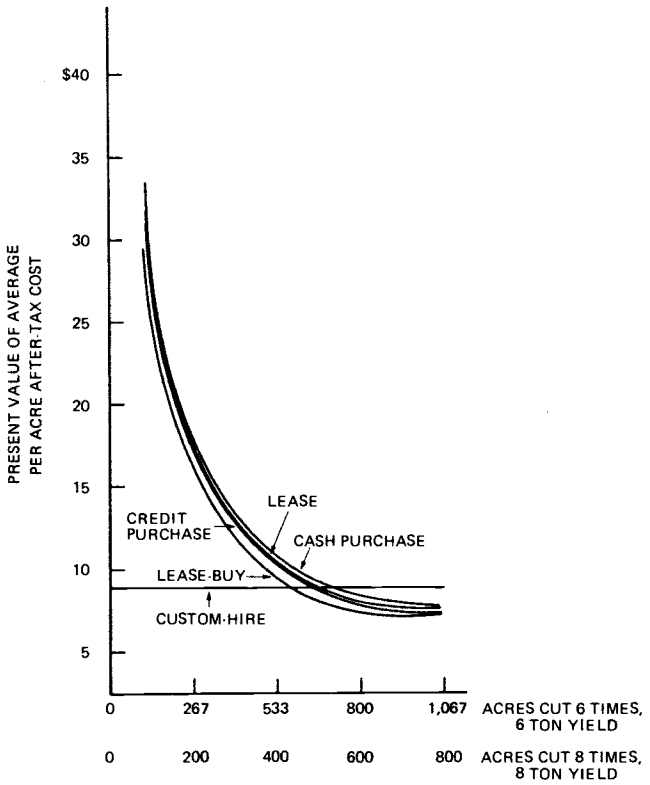

FIGURE 13. PRESENT VALUE OF AVERAGE PER ACRE COSTS FOR A SELF-PROPELLED BALE WAGON, SELECTED CONTROL ALTERNATIVES, VARIOUS ACREAGES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

value of $15,480. A credit purchase is financed with a 30 percent down payment and a $31,500 loan to be repaid in three, equal annual installments.

The lease-buy arrangement assumed a two-year lease followed by a purchase. Annual lease payments are $17,203.50 each, and the purchase price is $14,034 (30 percent down and the remainder borrowed on a two-year note). The cuber may also be leased for the entire four-year period at an annual cost of $13,783.50.

A custom rate of $16 per acre is assumed. The custom operator provides a windrower, cuber and wagon, water truck, and delivers the cubes. Consequently, the costs associated with this machinery and operators must be identified and included in the cash flows of all the competing control alternatives.16/ The base analysis assumes 140 acres cut eight times and an eight-ton yield. Projected cash flows for the five alternatives are presented in Appendix A, Tables 33-37.

As noted in Table 13, the present value of cutting, cubing and hauling costs over the four-year period are significantly lower with custom-hiring. Relative to the second best (credit purchase) and most expensive (lease) alternatives, custom-hiring enables savings of $11,450 and $21,044, respectively. The large capital investment inherent with a hay cuber makes it very difficult for smaller businesses to economically justify ownership or leasing. The analysis illustrates that farmers can at least mitigate the capital indivisibility problem by custom-hiring.

TABLE 13. PRESENT VALUE OF AFTER-TAX COSTS FOR A FIELD HAY CUBER, SELECTED CONTROL ALTERNATIVES, 10 PERCENT DISCOUNT RATE, 32 PERCENT MARGINAL TAX RATE, AND 280 HOURS (1,120 TONS OF HAY) OF ANNUAL MACHINE USE.

Control Alternative	Present Value of Before-Tax Costs	Present Value of Tax Credits	Present Value of After-Tax Costs
Cash Purchase	$77,144	$22,159	$54,985
Credit Purchase	76,626	23,773	52,853
Lease-Buy	76,189	22,523	53,666
Lease	90,036	27,595	62,441
Custom-Hire	59,242	17,845	41,397

16/ Water truck and cuber repair costs were derived from P.S. Parsons, J.B. Dobie, R.G. Curley, Alfalfa Harvesting Costs, Axt-346, Agricultural Extension Service, University of California, Davis, California, March, 1973.

Sensitivity Analysis. Variations in the discount rate do not materially affect the cost rankings of the five control alternatives (Figure 14). Custom-hire increases its advantage over the next best alternative from $3,639 at a zero discount rate to $13,696 at a 20 percent discount rate. Leasing improves vis-a-vis the purchase alternatives with advances in the discount rate but is competitive only at rates as high as 20 percent.

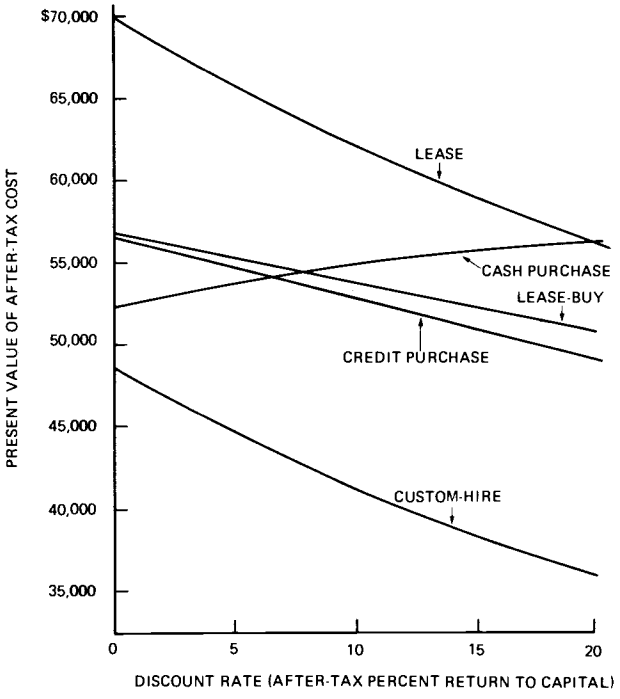

FIGURE 14. PRESENT VALUE OF COSTS FOR A FIELD HAY CUBER, SELECTED CONTROL ALTERNATIVES, OPERATED 280 HOURS ANNUALLY (140 ACRES), VARIOUS DISCOUNT RATES, AND A 32 PERCENT MARGINAL TAX RATE.

Increasing the size of the business favors the non-custom-hire alternatives due to the spreading of fixed costs over more acres. Per-acre custom rates are assumed to remain constant at all acreages. Assuming a 10 percent discount rate and eight cuttings, custom-hire is optimal up to about 217 acres; beyond this point credit purchase has a slight advantage over the other purchase alternatives (Figure 15). The break-even acreage between custom-hire and lease-buy and cash purchase is 227 and 233 acres, respectively.

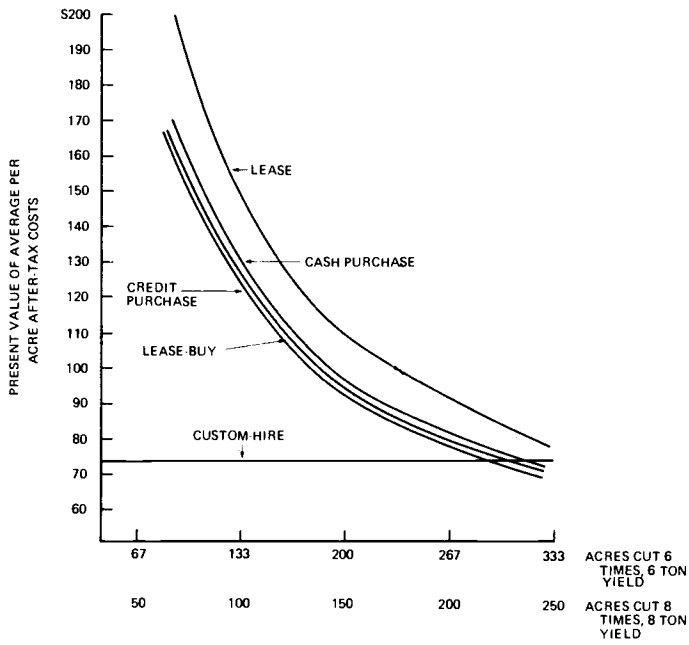

FIGURE 15. PRESENT VALUE OF AVERAGE PER ACRE COSTS FOR A FIELD HAY CUBER, SELECTED CONTROL ALTERNATIVES, VARIOUS ACREAGES, 10 PERCENT DISCOUNT RATE, AND A 32 PERCENT MARGINAL TAX RATE.

SUMMARY AND CONCLUSIONS

The large amounts of capital needed to acquire and operate farm machinery makes effective machinery management a key factor in determining the financial success of Arizona's farms. While farmers are confronted with numerous machinery management problems, the findings of this study indicate that selecting the means of controlling machinery resources is one of the most important. For example, the present value of cost differences between the high and low cost control alternative identified in the base analyses of eight commonly used farm machines ranged from about $2,000 (self-propelled bale wagon) to $21,000 (hay cuber), and averages $9,241.

Arizona farmers may find as many as six different alternatives to consider in controlling major pieces of farm machinery, i.e., (1) cash purchase, (2) credit purchase, (3) lease-buy, (4) lease, (5) rent, and (6) custom-hire. Deciding which of these alternatives is optimal is a complex economic problem necessitating the consideration of many financial variables. The primary objectives of this study were to identify the terms associated with different machinery control alternatives and to make cost comparisons between these alternatives for major Arizona farm machines. The importance of the role played by certain business factors in determining the optimal alternative was also ascertained.

It is apparent from study results that no specific recommendations regarding least-cost control methods can be made. Clearly, what is optimal depends upon factors that are often unique to individual farm businesses. However, some general conclusions can be drawn.

Farmers with moderate or small sized operations should give careful consideration to custom-hiring and renting machinery where possible. The study dramatically illustrates that to justify owning major pieces of machinery, businesses must be large enough to permit extensive dilution of fixed ownership costs. In some cases this critical minimum size is quite large. For example, assuming typical 1973 custom rates, break-even acreages between custom-hiring and credit purchase did not occur within reasonable upper limits of annual machine use that can be expected on many individual farms in the case of the cotton picker and grain combine.

The basic reasons custom-hiring often held an advantage over ownership are two-fold. First, many farmers with excess machinery capacity are performing custom work in an attempt to increase annual machine use and realize attendant per unit economies. Where this is the case, there may be a tendency for custom rates to approach only the variable component of machinery costs. Secondly, custom operators are able to get high utilization of their machinery and, therefore, have lower per unit costs. This makes it possible to charge lower custom rates and still realize a reasonable return on their investment.

In general, leasing was the most expensive means of acquiring machinery. While leasing was found to free working capital, it is only where farmers have alternative uses for this capital yielding after-tax returns of around 20 percent or better does leasing really become competitive. The relative expensiveness of leasing was not so much due to high financing costs as it was to the lack of an equity interest in the machine at the conclusion of the control period. Interest rates implicit in full-payback leases were found to be quite comparable with that being paid on machinery loans, i.e., 9-10 percent. This is in contrast to other studies which have generally reported lease finance costs to be considerably higher.

Assuming after-tax yields from alternative investments are in the neighborhood of 10 percent, cost differences between cash purchase, credit purchase, and lease-buy were quite narrow for most machines. Typically, costs for these alternatives fell below leasing but above custom-hiring and renting at low and moderate rates of annual machine use. Assuming farmers have both excess debt capacity and equity capital reserves, they should be indifferent between a cash and credit purchase when the after-tax cost of debt capital equals the discount rate (i.e., the after-tax rate of return from alternative investment opportunities). A cash purchase is optimal when the discount rate falls below the cost of debt, and a credit purchase is best when the opposite occurs.

By varying assumptions regarding the value of certain economic variables hypothesized to be critical to the machinery control problem, some insights regarding their actual importance were obtained. As already pointed out, the discount rate and extent of machine use are factors that must be considered when identifying the optimal alternative. Conversely, the marginal tax rate and associated tax credits were found not to be an important consideration, indicating that the non-tax related elements of the control alternative cash flows are of greater importance. This conclusion is based on the fact that increasing marginal tax rates from 14 to 70 percent (the maximum federal level) failed in most cases to cause reversals in the cost rankings of competing control alternatives.

The results further indicate that adoption of accelerated rather than straight line depreciation improves purchase relative to hire alternatives; also, the improvement increases with advances in the discount rate. The only benefit realized from accelerated depreciation is an increase in the

present value of tax savings, and since these savings were generally not a key factor, the depreciation method used by farmers has only a marginal impact on the machinery purchase versus hire decision.

Study Limitations

Study results should be qualified by briefly noting the more important problems and shortcomings inherent with adopted procedures. First, no attempt was made to consider the importance of operational timeliness. It was assumed that no differences existed between control alternatives with respect to the points in time during which field operations were performed. This assumption likely understates custom-hiring costs since machinery control is often less complete with this alternative.

Secondly, case situations used in the study were restricted to specific lease fees, rent payments, custom-hire rates, machinery list prices, down payments, interest rates, length of control periods, and salvage values. Consequently, care should be exercised in generalizing results to those situations where these factors differ widely from those outlined. The surveys indicated that considerable variation in these variables does, in fact, occur.

Finally, due to current high rates of inflation, the absolute level of control alternative costs identified for 1973 will likely understate those for later years. However, to the extent that inflation pushes investments and costs upward at a rate that is uniform for all control alternatives, study cost comparisons remain valid.

APPENDIX A

CASH FLOW PROJECTIONS USED IN THE ANALYSIS OF CONTROL ALTERNATIVES

1. 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR

TABLE 1. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR.

Year	Purchase Price	Depreciation	Investment Credit	Total Tax Credit a/	Salvage Value	After-Tax Cost b/
1974	$26,000.00	---	---	---	---	$26,000.00
1975	---	$13,000.00	$606.00	$4,766.00	---	-4,766.00
1976	---	338.00	---	108.16	---	-108.16
1977	---	---	---	---	---	---
1978	---	---	---	---	$12,662.00	-12,662.00
Total	$26,000.00	$13,338.00	$606.00	$4,874.16	$12,662.00	$ 8,463.84

a/ Equals .32 (marginal tax rate) times depreciation plus investment credit.

b/ Equals purchase price minus total tax credit minus salvage value.

TABLE 2. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR.

Year	Down Payment or Principal	Interest @ 9-1/2%	Depreciation	Investment Credit	Total Tax Credit a/	Salvage Value	After-Tax Cost b/
1974	$ 7,800.00	---	---	---	---	---	$ 7,800.00
1975	6,066.66	$1,729.00	$13,000.00	$606.00	$5,319.29	---	2,476.37
1976	6,066.67	1,152.67	338.00	---	477.01	---	6,742.33
1977	6,066.67	576.33	---	---	184.42	---	6,458.58
1978	---	---	---	---	---	$12,662.00	-12,662.00
Total	$26,000.00	$3,458.00	$13,338.00	$606.00	$5,980.72	$12,662.00	$10,815.28

a/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest and depreciation) plus investment credit.

b/ Equals down payment or principal plus interest minus salvage value.

TABLE 3. PROJECTED CASH FLOW FOR LEASE-BUY OF A 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Depreciation	Total Tax Credit a/	Salvage Value	After-Tax Cost b/
1974	$ 9,939.80	---	---	---	---	---	$ 9,939.80
1975	9,939.80	---	---	---	$3,180.74	---	6,759.06
1976	---	$2,432.50	---	---	3,180.74	---	-748.24
1977	---	2,837.93	$539.21	$356.77	286.71	---	3,090.43
1978	---	2,837.93	269.60	356.77	-756.48 c/	$12,662.00	-8,797.99
Total	$19,876.60	$8,108.36	$808.81	$713.54	$5,891.71	$12,662.00	$10,240.06

a/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payments, interest and depreciation).

b/ Equals lease payment, down payment, or principal plus interest minus total tax credit minus salvage value.

c/ Equals depreciation recapture [.32 ($713.54)] plus capital gains liability [.16($12,662.00 - $6,771.60)] minus tax credit for deductible interest and depreciation.

TABLE 4. PROJECTED CASH FLOW FOR LEASED AND RENTED 165-HORSEPOWER, FOUR-WHEEL DRIVE TRACTOR.

Lease					Rent a/			
Year	Lease Payment	Investment Credit	Total Tax Credit b/	After-Tax Net Cost c/	Year	Rental Payment	Total Tax Credit b/	After-Tax Cost c/
1974	$ 7,963.80	---	---	$ 7,963.80	1974	$ 8,100.00	---	$ 8,100.00
1975	7,963.80	$606.00	$ 3,154.32	4,809.38	1975	8,100.00	$ 2,592.00	5,508.00
1976	7,963.80	---	2,548.42	5,415.38	1976	8,100.00	2,592.00	5,508.00
1977	7,963.80	---	2,548.42	5,415.38	1977	8,100.00	2,592.00	5,508.00
1978	---	---	2,548.42	-2,548.42	1978	---	2,592.00	-2,592.00
Total	$31,855.20	$606.00	$10,799.68	$21,055.52	Total	$32,400.00	$10,368.00	$22,032.00

a/ Assumes tractor is rented five months per year.

b/ Equals .32(marginal tax rate) times lease and rental payments.

c/ Equals lease or rent payment minus total tax credit.

2. SELF-PROPELLED COTTON PICKER

TABLE 5. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A SELF-PROPELLED COTTON PICKER OPERATED 600 HOURS (300 ACRES) ANNUALLY.

Year	Purchase Price	Operating Cost and THI a/	Tramping and Hauling	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Costs c/
1974	$33,000.00	---	---	---	---	---	---	$33,000.00
1975	---	$ 7,066.26	$ 4,923.00	$18,348.00	$770.00	$10,477.92	---	1,511.34
1976	---	8,558.18	4,923.00	---	---	4,313.97	---	9,167.21
1977	---	9,668.08	4,923.00	---	---	4,669.15	$14,652.00	-4,730.07
Total	$33,000.00	$25,292.52	$14,769.00	$18,348.00	$770.00	$19,461.04	$14,652.00	$38,948.48

a/ Operating expenses include fuel, oil, repairs, and labor for the picker operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating costs and THI, tramping and hauling, and depreciation) plus investment credit.

c/ Equals purchase price plus operating cost and THI plus tramping and hauling costs minus total tax credit minus salvage value.

TABLE 6. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A SELF-PROPELLED COTTON PICKER OPERATED 600 HOURS (300 ACRES) ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Tramping and Hauling	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Costs c/
1974	$ 9,900.00	---	---	---	---	---	---	---	$ 9,900.00
1975	7,700.00	$2,194.50	$ 7,066.26	$ 4,923.00	$18,348.00	$770.00	$11,180.16	---	10,703.60
1976	7,700.00	1,463.00	8,558.18	4,923.00	---	---	4,782.14	---	17,862.04
1977	7,700.00	731.50	9,668.08	4,923.00	---	---	4,903.23	$14,652.00	3,467.35
Total	$33,000.00	$4,389.00	$25,292.52	$14,769.00	$18,348.00	$770.00	$20,865.53	$14,652.00	$41,932.99

a/ Operating expenses include fuel, oil, repairs, and labor for the picker operator. THI represents property taxes, housing, and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest, operating costs and THI, tramping and hauling, and depreciation) plus investment credit.

c/ Equals down payment or principal plus interest plus operating cost and THI plus tramping and hauling minus total tax credit minus salvage value.

TABLE 7. PROJECTED CASH FLOW FOR LEASE-BUY OF A SELF-PROPELLED COTTON PICKER OPERATED 600 HOURS (300 ACRES) ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Tramping and Hauling	Depre-ciation	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$12,615.90	---	---	---	---	---	---	---	$12,615.90
1975	12,615.90	---	---	$ 7,066.26	$ 4,923.00	---	$ 7,873.65	---	16,731.51
1976	---	$ 5,145.69	---	8,558.18	4,923.00	---	8,351.07	---	10,275.80
1977	---	5,145.69	$488.84	9,668.08	4,923.00	$596.90	4,127.87 d/	$14,652.00	1,445.74
Total	$25,231.80	$10,291.38	$488.84	$25,292.52	$14,769.00	$596.90	$20,352.59	$14,652.00	$41,068.95

a/ Operating expenses include fuel, oil, repairs, and labor for the picker operator. THI represents property taxes, housing, and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating cost and THI, tramping and hauling, and depreciation).

c/ Equals lease payment, down payment or principal plus interest plus operating cost and THI plus tramping and hauling minus total tax credit minus salvage value.

d/ Equals depreciation recapture [.32 ($596.90)] plus capital gains liability [.16 ($4,652.00 - $10,291.38)] minus tax credit for deductible interest, operating cost and THI, tramping and hauling, and depreciation.

TABLE 8. PROJECTED CASH FLOW FOR A LEASED SELF-PROPELLED COTTON PICKER OPERATED 600 HOURS (300 ACRES) ANNUALLY.

Year	Lease Payment	Operating Cost and THI a/	Tramping and Hauling	Investment Credit	Total Tax Credit b/	After-Tax Cost c/
1974	$11,800.80	---	---	---	---	$11,800.80
1975	11,800.80	$ 7,066.26	$ 4,923.00	$770.00	$ 8,382.82	15,407.24
1976	11,800.80	8,558.18	4,923.00	---	8,090.23	17,191.75
1977	---	9,668.08	4,923.00	---	8,445.40	6,145.68
Total	$35,402.40	$25,292.52	$14,769.00	$770.00	$24,918.45	$50,545.47

a/ Operating expenses include fuel, oil, repairs, and labor for the picker operator. THI represents property taxes, housing, and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, operating cost and THI, and tramping and hauling) plus investment credit.

c/ Equals lease payment plus operating cost and THI plus tramping and hauling minus total tax credit.

TABLE 9. PROJECTED CASH FLOW FOR CUSTOM-HIRED SELF-PROPELLED COTTON PICKER OPERATED 600 HOURS (300 ACRES) ANNUALLY.

Year	Custom-Hire Payment a/	Total Tax Credit b/	After-Tax Cost c/
1974	$14,849.10	---	$14,849.10
1975	14,849.10	$ 4,751.71	10,097.39
1976	14,849.10	4,751.71	10,097.39
1977	---	4,751.71	-4,751.71
Total	$44,547.30	$14,255.13	$30,292.17

a/ Equals custom-hire rate ($1.75 per hundredweight of seed cotton) times yield per acre for first and second pick (2,828 lbs.) times number of acres (300).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

c/ Equals custom-hire payment minus total tax credit.

3. 16-FOOT GRAIN COMBINE

TABLE 10. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Purchase Price	Operating Cost and THI a/	Hauling Cost	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Costs c/
1974	$23,000.00	---	---	---	---	---	---	$23,000.00
1975	---	$2,591.40	$2,891.08	$12,788.00	$536.67	$6,383.22	---	-900.74
1976	---	2,642.79	2,891.08	---	---	1,770.84	---	3,763.03
1977	---	2,832.44	2,891.08	---	---	1,831.53	$10,212.00	-6,320.01
Total	$23,000.00	$8,066.63	$8,673.24	$12,788.00	$536.67	$9,985.59	$10,212.00	$19,542.28

a/ Operating expenses include fuel, oil, repairs, labor for the combine operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating costs and THI, hauling cost, and depreciation) plus investment credit.

c/ Equals purchase price plus operating cost and THI plus hauling cost minus total tax credit minus salvage value.

TABLE 11. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Hauling Cost	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$ 6,900.00	---	---	---	---	---	---	---	$ 6,900.00
1975	5,366.66	$1,529.50	$2,591.40	$2,891.08	$12,788.00	$536.67	$ 6,872.66	---	5,505.98
1976	5,366.67	1,019.67	2,642.79	2,891.08	---	---	2,097.13	---	9,823.08
1977	5,366.67	509.83	2,832.44	2,891.08	---	---	1,994.67	$10,212.00	-606.65
Total	$23,000.00	$3,059.00	$8,066.63	$8,673.24	$12,788.00	$536.67	$10,964.46	$10,212.00	$21,622.41

a/ Operating expenses include fuel, oil, repairs, and labor for the combine operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest, operating cost and THI, hauling cost, and depreciation) plus investment credit.

c/ Equals down payment or principal plus operating cost and THI plus hauling cost minus total tax credit minus salvage value.

TABLE 12. PROJECTED CASH FLOW FOR LEASE-BUY OF A 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Hauling Cost	Depreciation	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$ 8,792.90	---	---	---	---	---	---	---	$ 8,792.90
1975	8,792.90	---	---	$2,591.40	$2,891.08	---	$ 4,568.12	---	9,707.26
1976	---	$3,586.39	---	2,642.79	2,891.08	---	4,584.57	---	4,535.69
1977	---	$3,586.39	$340.71	2,832.44	2,891.08	$447.60	1,454.28 d/	$10,212.00	-2,015.66
Total	$17,585.80	$7,172.78	$340.71	$8,066.63	$8,673.24	$447.60	$10,606.97	$10,212.00	$21,020.19

a/ Operating expenses include fuel, oil, repairs and labor for the combine operator. THI represents property taxes, housing, and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating cost and THI, hauling cost, and depreciation).

c/ Equals lease payment, down payment or principal plus interest, plus operating cost and THI plus hauling cost minus total tax credit minus salvage value.

d/ Equals depreciation recapture [.32 ($447.60)] plus capital gains liability [.16 ($10,212.00 - $7,172.78)] minus tax credit for deductible interest, operating cost and THI, hauling cost and depreciation.

TABLE 13. PROJECTED CASH FLOW FOR A LEASED 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Lease Payment	Operating Cost and THI a/	Hauling Cost	Investment Credit	Total Tax Credit b/	After-Tax Cost c/
1974	$ 8,224.80	---	---	---	---	$ 8,224.80
1975	8,224.80	$2,591.40	$2,891.08	$536.67	$ 4,923.00	8,784.28
1976	8,224.80	2,642.79	2,891.08	---	4,402.77	9,355.90
1977	---	2,832.44	2,891.08	---	4,463.46	1,260.06
Total	$24,674.40	$8,066.63	$8,673.24	$536.67	$13,789.23	$27,625.04

a/ Operating expenses include fuel, oil, repairs and labor for the combine operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, operating cost and THI, and hauling cost) plus investment credit.

c/ Equals lease payment plus operating cost and THI plus hauling cost minus total tax credit minus salvage value.

TABLE 14. PROJECTED CASH FLOW FOR A RENTED 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Rent Payment a/	Operating Cost and THI b/	Hauling Cost	Total Tax Credit c/	After-Tax Cost d/
1974	$2,500.00	---	---	---	$ 2,500.00
1975	2,500.00	$2,591.40	$2,891.08	$2,554.39	5,428.09
1976	2,500.00	2,642.79	2,891.08	2,570.84	5,463.03
1977	---	2,832.44	2,891.08	2,631.53	3,091.99
Total	$7,500.00	$8,066.63	$8,673.24	$7,756.76	$16,483.11

a/ Equals daily rental rate ($100) times number of days (25).

b/ Operating expenses include fuel, oil, repairs, labor for the combine operator. THI represents property taxes, housing and insurance costs.

c/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., rental payments, operating cost and THI, and hauling cost).

d/ Equals rental payment plus operating cost and THI plus hauling cost minus total tax credit.

TABLE 15. PROJECTED CASH FLOW FOR CUSTOM-HIRED 16-FOOT GRAIN COMBINE OPERATED 250 HOURS (750 ACRES) ANNUALLY.

Year	Custom-Hire Payment a/	Total Tax Credit b/	After-Tax Cost c/
1974	$ 7,500.00	---	$ 7,500.00
1975	7,500.00	$2,400.00	5,100.00
1976	7,500.00	2,400.00	5,100.00
1977	---	2,400.00	-2,400.00
Total	$22,500.00	$7,200.00	$15,300.00

a/ Equals custom-hire rate ($10 per acre) times number of acres (750).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

c/ Equals rental payment minus total tax credit.

4. ENGINE DRIVE HAY BALER

TABLE 16. PROJECTED CASH FLOW FOR A CASH PURCHASE OF AN ENGINE DRIVE HAY BALER OPERATED 275 HOURS (240 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Purchase Price	Operating Cost and THI a/	Wire Cost	Tractor Cost	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$10,120.00	---	---	---	---	---	---	---	$10,120.00
1975	---	$1,632.98	$ 3,609.60	$1,498.28	$6,193.44	$236.14	$4,375.12	---	2,365.74
1976	---	1,730.92	3,609.60	1,533.85	---	---	2,199.80	---	4,674.57
1977	---	1,841.79	3,609.60	1,588.45	---	---	2,252.75	$3,927.00	860.09
Total	$10,120.00	$5,205.69	$10,828.80	$4,620.58	$6,193.44	$236.14	$8,827.67	$3,927.00	$18,020.40

a/ Operating expenses include fuel, oil, repairs, and labor. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating cost and THI, wire cost, tractor cost and depreciation) plus investment credit.

c/ Equals purchase price plus operating cost and THI plus wire cost plus tractor cost minus total tax credit minus salvage value.

TABLE 17. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF ENGINE DRIVE HAY BALER OPERATED 275 HOURS (240 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Wire Cost	Tractor Cost	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$ 3,542.00	---	---	---	---	---	---	---	---	$ 3,542.00
1975	2,192.66	$ 624.91	$1,632.98	$ 3,609.60	$1,498.28	$6,193.44	$236.14	$4,575.09	---	4,983.34
1976	2,192.67	416.61	1,730.92	3,609.60	1,533.85	---	---	2,333.11	---	7,150.54
1977	2,192.67	208.30	1,841.79	3,609.60	1,588.45	---	---	2,319.40	$3,927.00	3,194.41
Total	$10,120.00	$1,249.82	$5,205.69	$10,828.80	$4,620.58	$6,193.44	$236.14	$9,227.60	$3,927.00	$18,870.29

a/ Operating expenses include fuel, oil, repairs, and labor. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., depreciation, interest, operating cost and THI, wire cost and tractor cost) plus investment credit.

c/ Equals down payment or principal plus interest plus operating cost and THI, plus wire cost plus tractor cost minus total tax credit minus salvage value.

TABLE 18. PROJECTED CASH FLOW FOR LEASE-BUY OF AN ENGINE DRIVE HAY BALER OPERATED 275 HOURS (240 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Wire Cost	Tractor Cost	Depreciation	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$3,868.88	---	---	---	---	---	---	---	---	$ 3,868.88
1975	3,868.88	---	---	$1,632.98	$ 3,609.60	$1,498.28	---	$3,395.12	---	7,214.62
1976	---	$1,578.01	---	1,730.92	3,609.60	1,533.85	---	3,437.84	---	5,014.54
1977	---	1,578.01	$149.91	1,841.79	3,609.60	1,588.45	$157.80	2,177.37 d/	$3,927.00	2,663.39
Total	$7,737.76	$3,156.02	$149.91	$5,205.69	$10,828.80	$4,620.58	$157.80	$9,010.33	$3,927.00	$18,761.43

a/ Operating expenses include fuel, oil, repairs and labor. THI represents property taxes, housing, and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating cost and THI, wire cost, tractor cost, and depreciation).

c/ Equals lease payment, down payment or principal plus interest plus operating cost and THI plus wire cost plus tractor cost minus total tax credit minus salvage value.

d/ Equals depreciation recapture [.32 ($157.80)] plus capital gains liability [.16 ($3,927.00 - $3,156.02)] minus tax credit for deductible interest, operating cost and THI, wire cost, tractor cost and depreciation.

TABLE 19. PROJECTED CASH FLOW FOR A LEASED ENGINE DRIVE HAY BALER OPERATED 275 HOURS (240 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Lease Payment	Operating Cost and THI a/	Wire Cost	Tractor Cost	Investment Credit	Total Tax Credit b/	After-Tax Cost c/
1974	$ 3,618.91	---	---	---	---	---	$ 3,618.91
1975	3,618.91	$1,632.98	$ 3,609.60	$1,498.28	$236.14	$ 3,551.27	6,808.50
1976	3,618.91	1,730.92	3,609.60	1,533.85	---	3,357.85	7,135.43
1977	---	1,841.79	3,609.60	1,588.45	---	3,410.80	3,629.04
Total	$10,856.73	$5,205.69	$10,828.80	$4,620.58	$236.14	$10,319.92	$21,191.88

a/ Operating expenses include fuel, oil, repairs and labor. THI represents property taxes, housing and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, operating expenses, wire cost, and tractor cost) plus investment credit.

c/ Equals lease payment plus operating cost and THI plus wire cost plus tractor cost minus total tax credit.

TABLE 20. PROJECTED CASH FLOW FOR A RENTED ENGINE DRIVE HAY BALER OPERATED 275 HOURS (240 ACRES @ 8 TON PER ACRE) ANNUALLY.

Year	Rent Payment a/	Operating Cost and THI b/	Wire Cost	Tractor Cost	Total Tax Credit c/	After-Tax Cost d/
1974	$2,600.00	---	---	---	---	$ 2,600.00
1975	2,600.00	$1,632.98	$ 3,609.60	$1,498,28	$2,989.07	6,351.79
1976	2,600.00	1,730.92	3,609.60	1,533.85	3,031.80	6,442.57
1977	---	1,841.79	3,609.60	1,588.45	3,084.75	3,955.09
Total	$7,800.00	$5,205.69	$10,828.80	$4,620.58	$9,105.62	$19,349.45

a/ Equals daily rental rate ($65) times number of per cutting days (5) times number of cuttings (8).

b/ Operating expenses include fuel, oil, repairs, and labor. THI represents property taxes, housing and insurance.

c/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., rent payments, operating costs and THI, wire cost and tractor cost).

d/ Equals rent payment plus operating cost and THI plus wire cost plus tractor cost minus total tax credit.

TABLE 21. PROJECTED CASH FLOW FOR CUSTOM-HIRED ENGINE DRIVE HAY BALER USED TO BALE 1,920 TONS (240 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Custom-Hire Payment a/	Total Tax Credit b/	After-Tax Cost c/
1974	$ 9,600.00	---	$ 9,600.00
1975	9,600.00	$3,072.00	6,528.00
1976	9,600.00	3,072.00	6,528.00
1977	---	3,072.00	-3,072.00
Total	$28,800.00	$9,216.00	$19,584.00

a/ Equals custom-hire rate ($5.00 per ton) times number of tons per acre (8) times number of acres (240).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

c/ Equals custom-hire payment minus total tax credit.

5. 14-FOOT SELF-PROPELLED WINDROWER

TABLE 22. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Purchase Price	Operating Cost and THI a/	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$13,000.00	---	---	---	---	---	$13,000.00
1975	---	$1,830.64	$6,500.00	$303.33	$2,969.13	---	-1,138.49
1976	---	1,955.69	1,404.00	---	1,075.10	---	880.59
1977	---	2,124.46	---	---	679.83	---	1,444.63
1978	---	2,247.23	---	---	719.11	$5,096.00	-3,567.88
Total	$13,000.00	$8,158.02	$7,904.00	$303.33	$5,443.17	$5,096.00	$10,618.85

a/ Operating expenses include fuel, oil, repairs and labor for the windrower operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expense (i.e., operating cost, THI and depreciation) plus investment credit.

c/ Equals purchase price plus operating cost and THI minus total tax credit minus salvage value.

TABLE 23. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$ 3,900.00	---	---	---	---	---	---	$ 3,900.00
1975	3,033.33	$ 864.50	$1,830.64	$6,500.00	$303.33	$3,245.77	---	2,482.70
1976	3,033.33	576.33	1,955.69	1,404.00	---	1,259.53	---	4,305.82
1977	3,033.34	288.17	2,124.46	---	---	772.04	---	4,673.93
1978	---	---	2,247.23	---	---	719.11	$5,096.00	-3,567.88
Total	$13,000.00	$1,729.00	$8,158.02	$7,904.00	$303.33	$5,996.45	$5,096.00	$11,794.57

a/ Operating expenses include fuel, oil, repairs, and labor for the windrower operator. THI represents property taxes, housing and insurance costs.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest, operating cost and THI, and depreciation).

c/ Equals down payment or principal plus interest plus operating cost and THI minus total tax credit minus salvage value.

TABLE 24. PROJECTED CASH FLOW FOR A LEASE-BUY OF A 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Depreciation	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$4,969.90	---	---	---	---	---	---	$ 4,969.90
1975	4,969.90	---	---	$1,830.64	---	$2,176.17	---	4,624.37
1976	---	$1,216.25	---	1,955.69	---	2,216.19	---	955.75
1977	---	1,418.96	$269.60	2,124.46	$222.98	837.45	---	2,975.57
1978	---	1,418.96	134.80	2,247.23	222.98	524.20 d/	$5,096.00	-1,819.21
Total	$9,939.80	$4,054.17	$404.40	$8,158.02	$445.96	$5,754.01	$5,096.00	$11,706.38

a/ Operating expenses include fuel, oil, repairs, and labor for the windrower operator. THI represents property taxes, housing and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating cost and THI, and depreciation).

c/ Equals lease payment, down payment or principal, plus interest plus operating cost and THI minus total tax credit minus salvage value.

d/ Equals depreciation recapture [.32 ($445.96)] plus capital gains liability [.16 ($5,096.00 - $4,054.17)] minus tax credit for interest, operating cost and THI and depreciation.

TABLE 25. PROJECTED CASH FLOW FOR A LEASED 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Lease Payment	Operating Cost and THI a/	Investment Credit	Total Tax Credit b/	After-Tax Cost c/
1974	$ 3,981.90	---	---	---	$ 3,981.90
1975	3,981.90	$1,830.64	$303.33	$2,163.34	3,649.20
1976	3,981.90	1,955.69	---	1,900.03	4,037.56
1977	3,981.90	2,124.46	---	1,954.04	4,152.33
1978	---	2,247.23	---	1,993.32	253.91
Total	$15,927.60	$8,158.02	$303.33	$8,010.73	$16,074.89

a/ Operating expenses include fuel, oil, repairs, and labor for the windrower operator. THI represents property taxes, housing and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, and operating cost and THI) plus investment credit.

c/ Equals lease payment plus operating cost and THI minus total tax credit.

TABLE 26. PROJECTED CASH FLOW FOR A RENTED 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Rent Payment a/	Operating Cost and THI b/	Total Tax Credit c/	After-Tax Cost d/
1974	$ 2,600.00	---	---	$ 2,600.00
1975	2,600.00	$1,830.64	$1,417.80	3,012.84
1976	2,600.00	1,955.69	1,457.82	3,097.87
1977	2,600.00	2,124.46	1,511.83	3,212.63
1978	---	2,247.23	1,551.11	696.12
Total	$10,400.00	$8,158.02	$5,938.56	$12,619.46

a/ Equals daily rental rate ($65) times number of per cutting days (5) times number of cuttings (8).

b/ Operating expenses includes fuel, oil, repairs, and labor for the windrower operator. THI represents property taxes, housing and insurance.

c/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., rent payment, and operating cost and THI).

d/ Equals rent payment plus operating cost and THI minus total tax credit.

TABLE 27. PROJECTED CASH FLOW FOR CUSTOM-HIRED 14-FOOT SELF-PROPELLED WINDROWER OPERATED 225 HOURS (140 ACRES CUT 8 TIMES) ANNUALLY.

Year	Custom-Hire Payments a/	Total Tax Credit b/	After-Tax Cost c/
1974	$ 4,480.00	---	$ 4,480.00
1975	4,480.00	$1,433.60	3,046.40
1976	4,480.00	1,433.60	3,046.40
1977	4,480.00	1,433.60	3,046.40
1978	---	1,433.60	-1,433.60
Total	$17,920.00	$5,734.40	$12,185.60

a/ Equals custom rate ($4.00 per acre) times number of acres (140) times number of cuttings (8).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

c/ Equals custom-hire payment minus total tax credit.

6. SELF-PROPELLED BALE WAGON

TABLE 28. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A SELF-PROPELLED BALE WAGON OPERATED 250 HOURS (440 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Purchase Price	Operating Cost and THI a/	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$18,920.00	---	---	---	---	---	$18,920.00
1975	---	$ 2,612.58	$ 9,460.00	$441.47	$4,304.70	---	-1,692.12
1976	---	2,985.85	2,478.00	---	1,748.43	---	1,237.42
1977	---	3,292.17	---	---	1,053.49	---	2,238.68
1978	---	3,526.72	---	---	1,128.55	$6,982.00	-4,583.83
Total	$18,920.00	$12,417.32	$11,938.00	$441.47	$8,235.17	$6,982.00	$16,120.15

a/ Operating expenses include fuel, oil, repairs and labor for the bale wagon operator. THI represents property taxes, housing and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses, (i.e., operating cost and THI and depreciation) plus investment credit.

c/ Equals purchase price plus operating cost and THI minus total tax credit minus salvage value.

TABLE 29. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A SELF-PROPELLED BALE WAGON OPERATED 250 HOURS (440 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Depreciation	Investment Credit	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$ 5,676.00	---	---	---	---	---	---	$ 5,676.00
1975	4,414.66	$1,258.18	$ 2,612.58	$ 9,460.00	$441.47	$4,707.31	---	3,578.11
1976	4,414.67	838.79	2,985.85	2,478.00	---	2,016.84	---	6,222.47
1977	4,414.67	419.39	3,292.17	---	---	1,187.70	---	6,938.53
1978	---	---	3,526.72	---	---	1,128.55	$6,982.00	-4,583.83
Total	$18,920.00	$2,516.36	$12,417.32	$11,938.00	$441.47	$9,040.40	$6,982.00	$17,831.28

a/ Operating expenses include fuel, oil, repairs, and labor for the bale wagon operator. THI represents property taxes, housing, and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., interest, operating cost and THI, and depreciation) plus investment credit.

c/ Equals down payment or principal plus interest plus operating cost and THI minus total tax credit minus salvage value.

TABLE 30. PROJECTED CASH FLOW FOR A LEASE-BUY OF A SELF-PROPELLED BALE WAGON OPERATED 250 HOURS (400 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Operating Cost and THI a/	Depreciation	Total Tax Credit b/	Salvage Value	After-Tax Cost c/
1974	$4,160.00	---	---	---	---	---	---	$ 4,160.00
1975	4,160.00	---	---	$ 2,612.58	---	$2,167.23	---	4,605.35
1976	---	$ 3,429.60	---	2,985.85	---	2,286.67	---	4,128.78
1977	---	4,001.20	$ 760.23	3,292.17	$2,225.00	2,008.77	---	6,044.83
1978	---	4,001.20	380.11	3,526.72	2,225.00	1,962.18	$6,982.00	-1,036.15
Total	$8,320.00	$11,432.00	$1,140.34	$12,417.32	$4,450.00	$8,424.85	$6,982.00	$17,902.81

a/ Operating expenses include fuel, oil, repairs, and labor for the bale wagon operator. THI represents property taxes, housing, and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating costs and THI, and depreciation).

c/ Equals lease payment, down payment, or principal plus interest plus operating cost and THI minus total tax credit minus salvage value.

TABLE 31. PROJECTED CASH FLOW FOR A LEASED SELF-PROPELLED BALE WAGON OPERATED 250 HOURS (440 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Lease Payment	Operating Cost and THI a/	Investment Credit	Total Tax Credit b/	After-Tax Cost c/
1974	$ 4,160.00	---	---	---	$ 4,160.00
1975	4,160.00	$ 2,612.58	$441.47	$2,608.70	4,163.88
1976	4,160.00	2,985.85	---	2,286.67	4,859.18
1977	4,160.00	3,292.17	---	2,384.69	5,067.48
1978	---	3,526.72	---	2,459.75	1,066.97
Total	$16,640.00	$12,417.32	$441.47	$9,739.81	$19,317.51

a/ Operating expenses include fuel, oil, repairs and labor for the bale wagon. THI represents property taxes, housing, and insurance.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment and operating cost and THI) plus investment credit.

c/ Equals lease payment plus operating cost and THI minus total tax credit.

TABLE 32. PROJECTED CASH FLOW FOR CUSTOM-HIRED SELF-PROPELLED BALE WAGON OPERATED 250 HOURS (440 ACRES @ 8 TONS PER ACRE) ANNUALLY.

Year	Custom-Hire Payment a/	Total Tax Credit b/	After-Tax Cost c/
1974	$ 6,758.40	---	$ 6,758.40
1975	6,758.40	$2,162.69	4,595.71
1976	6,758.40	2,162.69	4,595.71
1977	6,758.40	2,162.69	4,595.71
1978	---	2,162.69	-2,162.69
Total	$27,033.60	$8,650.76	$18,382.84

a/ Equals custom rate ($.12/bale) times number of bales per acre (16) times number of acres (260).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

c/ Equals custom-hire payment minus total tax credit.

7. FIELD HAY CUBER

TABLE 33. PROJECTED CASH FLOW FOR A CASH PURCHASE OF A FIELD HAY CUBER AND TO CUT AND WINDROW, CUBE, AND TRANSPORT 1,120 TONS OF HAY ANNUALLY.

Year	Purchase Price	Cuber Operating Cost and THI a/	Depreciation	Investment Credit	Salvage Value	Hauling Costs	Water Cost	Total Tax Credit b/	After-Tax Costs	Total After-Tax Cost c/
1974	$45,000.00	---	---	---	---	---	---	---	$ 3,900.00	$48,900.00
1975	---	$ 5,786.96	$22,500.00	$1,050.00	---	$2,240.00	$ 580.00	$11,004.23	2,482.70	85.43
1976	---	4,970.48	7,020.00	---	---	2,240.00	580.00	4,739.35	4,305.82	7,356.95
1977	---	4,876.52	---	---	---	2,240.00	580.00	2,462.89	4,673.93	9,907.56
1978	---	4,795.52	---	---	$15,480.00	2,240.00	580.00	2,436.97	-3,567.88	-13,869.33
Total	$45,000.00	$20,429.48	$29,520.00	$1,050.00	$15,480.00	$8,960.00	$2,320.00	$20,643.44	$11,794.57	$52,380.61

a/ Operating expenses include fuel, oil, repairs and labor for the cuber operator.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating expenses and THI, depreciation, hauling, and water truck) plus investment credit.

c/ Equals sum of purchase price, operating cost and THI, and hauling, water truck and windrower costs, minus total tax credit and salvage value.

TABLE 34. PROJECTED CASH FLOW FOR A CREDIT PURCHASE OF A FIELD HAY CUBER AND TO CUT AND WINDROW, CUBE, AND TRANSPORT 1,120 TONS OF HAY ANNUALLY.

Year	Down Payment or Principal	Interest @ 9-1/2%	Cuber Operating Cost and THI a/	Depreciation	Investment Credit	Salvage Value	Hauling Cost	Water Truck	Total Tax Credit b/	After-Tax Windrower Cost	Total After-Tax Cost c/
1974	$13,500.00	---	---	---	---	---	---	---	---	$ 3,900.00	$17,400.00
1975	10,500.00	$2,992.50	$ 5,786.96	$22,500.00	$1,050.00	---	$2,240.00	$ 580.00	$11,961.83	2,482.70	12,620.33
1976	10,500.00	1,995.00	4,970.48	7,020.00	---	---	2,240.00	580.00	5,377.75	4,305.82	19,213.55
1977	10,500.00	997.50	4,876.52	---	---	---	2,240.00	580.00	2,782.09	4,673.93	21,085.86
1978	---	---	4,795.52	---	---	$15,480.00	2,240.00	580.00	2,436.97	-3,567.88	-13,869.33
Total	$45,000.00	$5,985.00	$20,429.48	$29,520.00	$1,050.00	$15,480.00	$8,960.00	$2,320.00	$22,558.64	$11,794.57	$56,450.41

a/ Operating expenses include fuel, oil, repairs and labor for the cuber operator.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating expenses and THI, interest, depreciation, hauling and water truck) plus investment credit.

c/ Equals sum of down payment or principal, interest, operating cost and THI, and hauling cost, water truck and windrower costs, minus total tax credit and salvage value.

TABLE 35. PROJECTED CASH FLOW FOR LEASE-BUY OF A FIELD HAY CUBER AND TO CUT AND WINDROW, CUBE, AND TRANSPORT 1,120 TONS OF HAY ANNUALLY.

Year	Lease Payment	Down Payment or Principal	Interest @ 9-1/2%	Cuber Operating Cost and THI a/	Depreciation	Salvage Value	Hauling Cost	Water Truck	Total Tax Credit b/	After-Tax Windrower Cost	Total After-Tax Cost c/
1974	$17,203.50	---	---	---	---	---	---	---	---	$ 3,900.00	$21,103.50
1975	17,203.50	---	---	$ 5,786.96	---	---	$2,240.00	$ 580.00	$ 8,259.35	2,482.70	20,033.81
1976	---	$ 4,210.10	---	4,970.48	---	---	2,240.00	580.00	7,998.08	4,305.82	8,308.32
1977	---	4,911.80	$ 933.24	4,876.52	$ 659.58	---	2,240.00	580.00	2,972.59	4,673.93	15,242.90
1978	---	4,911.80	466.62	4,795.52	659.58	$15,480.00	2,240.00	580.00	2,143.80 d/	-3,567.88	-8,197.74
Total	$34,407.00	$14,033.70	$1,399.86	$20,429.48	$1,319.16	$15,480.00	$8,960.00	$2,320.00	$21,373.82	$11,794.57	$56,490.79

a/ Operating expenses include fuel, oil, repairs, and labor for the cuber operator.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., lease payment, interest, operating costs and THI, depreciation, hauling, and water truck) plus investment credit.

c/ Equals sum of lease payment, down payment or principal, interest, operating cost and THI, and hauling, water truck, and windrower costs minus total tax credit and salvage value.

d/ Equals depreciation recapture [.32 ($1,319.16)] plus capital gains liability [.16($15,480.00 - $14,033.70)] minus tax credit for deductible interest, operating cost and THI, depreciation, hauling cost and water truck cost.

TABLE 36. PROJECTED CASH FLOW TO LEASE A FIELD HAY CUBER AND TO CUT AND WINDROW, CUBE, AND TRANSPORT 1,120 TONS OF HAY ANNUALLY.

Year	Lease Payment	Cuber Operating Cost and THI a/	Investment Credit	Hauling Cost	Water Truck	Total Tax Credit b/	After-Tax Windrower Cost	Total After-Tax Cost c/
1974	$13,783.50	---	---	---	---	---	$ 3,900.00	$17,683.50
1975	13,783.50	$ 5,786.96	$1,050.00	$2,240.00	$ 580.00	$ 8,214.95	2,482.70	16,658.21
1976	13,783.50	4,970.48	---	2,240.00	580.00	6,903.67	4,305.82	18,976.13
1977	13,783.50	4,876.52	---	2,240.00	580.00	6,873.61	4,673.93	19,280.34
1978	---	4,795.52	---	2,240.00	580.00	6,847.68	-3,567.88	-2,800.04
Total	$55,134.00	$20,429.68	$1,050.00	$8,960.00	$2,320.00	$28,839.91	$11,794.57	$69,798.14

a/ Operating expenses include fuel, oil, repairs, and labor for the cuber operator.

b/ Equals .32 (marginal tax rate) times sum of tax deductible expenses (i.e., operating expenses, THI, depreciation, hauling and water truck) plus investment credit.

c/ Equals sum of lease payment, operating cost and THI, and hauling, water truck and windrower costs minus total tax credit and salvage value.

TABLE 37. PROJECTED CASH FLOW REQUIRED TO CUSTOM-HIRE THE CUTTING AND WINDROWING, CUBING, AND TRANSPORTING OF 1,120 TONS OF HAY ANNUALLY.

Year	Custom-Hire Payment a/	Total Tax Credit b/	After-Tax Cost
1974	$17,920.00	---	$17,920.00
1975	17,920.00	$ 5,734.40	12,185.60
1976	17,920.00	5,734.40	12,185.60
1977	17,920.00	5,734.40	12,185.60
1978	---	5,734.40	-5,734.40
Total	$71,680.00	$22,937.60	$48,742.40

a/ Equals custom rate ($16 per ton) times number of tons per acre (8) times number of acres (140).

b/ Equals .32 (marginal tax rate) times custom-hire payment.

APPENDIX B

ANALYTICAL MODELS USED TO DERIVE CONTROL ALTERNATIVE COSTS

Mathematical formulations of the models used to derive the present value of after-tax control alternative costs are outlined below.

Cash or Credit Purchase

The present value of before-tax costs for a cash or credit purchase (PVCp) was derived in the following manner:

$$(1)\quad PVCp = DP + \sum_{j=1}^{m}\left[\frac{Pj + Rj + Lj + PTj + ISj + ITj + Fj}{(1 + DR/12)^{j}}\right] - \frac{Sm}{(1 + DR/12)^{m}}$$

where

DP = down payment
Pj = principal payment in month j (credit purchase only)
Rj = repair costs in month j
Lj = labor costs in month j
PTj = property taxes paid in month j
ISj = insurance premium payment in month j
ITj = interest paid in month j (credit purchase only)
Fj = fuel, oil, and lubrication costs in month j
Sm = salvage value in month m
DR = annual discount rate
m = total number of months in control period

The present value of tax credits (PVTCp) was calculated as follows:

$$(2)\quad PVTCp = \sum_{i=13}^{m+1}\left[\sum_{j=1}^{i-1}\frac{(Rj + Lj + PTj + ISj + ITj + Fj + Dj)\ MTR}{(1 + DR/12)^{i}}\right] + \sum_{i=13}^{1}\left[\frac{\sum_{j=0}^{i-1}(ICj)}{(1 + DR/12)^{i}}\right]$$

where

Dj = depreciation deducted in month j
ICj = investment credit claimed in month j
MTR = marginal tax rate
i = month income taxes are paid
1 = interval over which investment credit may be carried forward and backward
other notation = same as before

To arrive at the present value of after-tax, or net, costs (PVNCp), equation (2) was subtracted from equation (1), i.e.,

$$(3)\quad PVNCp = PVCp - PVTCp$$

Lease or Rent

To derive the present value of before-tax lease or rent costs (PVC_{l-r}) the following approach was used:

$$(4)\quad PVC_{l-r} = LPo + \sum_{j=1}^{m}\left[\frac{LPj + Rj + PTj + ISj + ITj + Fj}{(1 + DR/12)^{j}}\right]$$

where

LPo = lease or rental fee paid in month j (j = 0...m)
other notation = same as before

Tax credits ($PVTC_{l-r}$) were determined accordingly,

$$(5)\quad PVTC_{l-r} = \sum_{i=13}^{m+1} \sum_{j=1}^{i-1} \left[\frac{(LPj + Rj + PTj + ISj + ITj + Lj)\ MTR}{(1 + DR/12)^{i}} \right] + \sum_{i=13}^{1} \left[\frac{\sum_{j=0}^{i-1} (ICj)}{(1 + DR/12)^{i}} \right]$$

The present value of after-tax lease and rent costs ($PVNC_{l-r}$) was derived by subtracting equation (5) from equation (4), i.e.,

$$(6)\quad PVNC_{l-r} = PVC_{l-r} - PVTC_{l-r}$$

Lease-Buy

Costs for the lease-buy alternatives were obtained by combining the appropriate segments of the purchase and lease models, i.e.,

$$(7)\quad PVNC_{l-b} = (PVCp + PVC_{l-r}) - (PVTCp + PVTC_{l-r})$$

In some cases, the PVTCp had to be reduced to reflect depreciation recapture and a capital gains liability. These reductions in tax credits equal

$$\frac{\left[\{Sm - (CB - \sum_{j-1}^{m} Dj)\} - \sum_{j-1}^{m} Dj \right] \quad 1/2\ MTR + \sum_{j=1}^{m} Di\ (MTR)}{(1 + DR/12)^{m+1}}$$

where

CB = cost basis when machine is purchased
other notation = same as before

Custom Hire

The present value of before-tax costs for custom-hired machinery (PVC_{c-h}) was determined by:

$$(8)\quad PVC_{c-h} = \sum_{j=1}^{m} \left[\frac{CR\ (Qj)}{(1 + DR/12)^{j}} \right]$$

where

CR = custom rate per unit of work
Qj = units of work hired in month j
other notation = same as before

To derive tax credits realized by custom-hiring ($PVTC_{c-h}$), the following formulation was used:

$$(9)\quad PVTC_{c-h} = \sum_{i=13}^{m+1} \left[\frac{\sum_{j=1}^{i-1} \{CR\ (Qj)\}\ MTR}{(1 + DR/12)^{i}} \right]$$

Equation (8) minus equation (9) equals the present value of after-tax custom-hire costs, i.e.,

$$PVNC_{c-h} = PVC_{c-h} - PVTC_{c-h}$$

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