AN OVERVIEW OF SOME COMPUTER PROGRAMS THAT HELP PRODUCERS BE BETTER MACHINERY MANAGERS

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ABSTRACT

During the 26 years that Herb Hinman has been a farm management extension economist at Washington State University, the issue of machinery management has proven to be a major factor in the success or failure of farm businesses. Successful machinery management often comes down to knowing the difference among NEED, WANT, and AFFORDABILITY; the ability to recognize the difference between need and want, and purchasing that what is needed until that what is wanted can be afforded. Herb presents some of the procedures and computer programs he has used over the years, relating to both successes and failures, to help producers better understand the impact that machinery management has upon the success and failure of their farm business and how they may become better machinery managers.

Key Words: machinery, management, need, want, affordability, computer programs, machine services

INTRODUCTION

Although machinery purchase is the most common way producers obtain machine services, there are numerous other ways for acquiring machinery services. A producer may 1) keep the current machine, 2) purchase a different machine, 3) lease a machine, 4) rent a machine, or 5) hire a custom operator to provide the machine service.

To help producers make more informed machinery purchase decisions, early in my career I developed a computer program (BUYORLEASE) that analyzed the financial advantages of purchasing machinery vs. leasing machinery vs. renting machinery vs. custom hiring machinery services. In addition, I developed a computer program (KEEPORBUY) that compared the alternatives of keeping the current machine vs. selling or trading in the current machine and purchasing a different machine vs. selling the current machine and leasing a different machine. These programs compared all the costs associated with the different alternatives of acquiring machinery services, compared the timing of the these costs over a given period of years under different assumptions, and calculated a net present value figure which would tell the manager what was his most financially feasible option. These programs were good programs and were presented to producer groups around the state a significant number of times. Today, I can say quite confidently, that while some machinery companies used the BUYORLEASE program to "push" their machine lease program, most likely no producers used either of these program in making machinery purchase decisions. I have found that when it comes to acquiring machinery service purchases, most producers know what they need, what they want, and the relative cost of

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each alternative. Within this realm of need, want, and cost, most financially rational producers are most interested in what they can afford, and then go with the need that closes fits their want.

Thus, while my old philosophy of acquiring machinery services was 1) determine what is needed, 2) determine what is available (new and used), 3) do a present value analysis, and 4) purchase or lease the least expensive net present value alternative. My current philosophy of acquiring machinery services has been 1) determine what is needed, 2) determine what is available (new and used), and then 3) purchase what you want as long as you can afford it!

ABILITY TO PAY

A question every producer contemplating the purchase of a machine is faced with is, "How much can I actually afford to pay for a machine?" Since agriculture by nature is a business that rarely generates a stable annual income, the amount a producer can actually afford to pay for a machine may be somewhat difficult to determine. In an attempt to help producers make this estimate as to an amount they will feel comfortable paying for a new investment, the spreadsheet shown below was developed.

ABILITY TO PAY FOR NEW INVESTMENTS

Estimate Average Annual Values During Life of New Loan

1)	Net Farm Cash Income (Before-Tax)	$56,760
2)	+ Non-Farm Income (Before-Tax)	20,000
3)	+ Depreciation & Expensing Option Deductions	62,400
4)	+ Interest on Term Debt	28,600
5)	+ Capital Leases Payments	-
6)	- Income & Social Security Tax Expense	15,350
7)	- Withdrawals for Family Living	50,000
8)	- Scheduled P & I payments	85,000
9)	- Scheduled Capital Lease Payments	-
10)	= Amount Available to Support Additional Debt and/or Capital Leases	17,410
11)	- Amount of Proposed Additional Capital Leases	-
12)	= Amount Available to Support Additional Debt	17,410
13)		
	a) Present Value of $1 Annuity	4.1002
	b) Number of Years	5
	c) Interest Rate	7.0%
14)	= Amount of Additional Debt Available Funds will Support	71,384
15)	+ Equity Available for Downpayment	20,000
16)	= Maximum Financially Feasible Price for New Investment	91,384

Using this spreadsheet, a producer can get estimates as to how much can be paid for a machine under different sets of assumptions. If a producer is only interested in generating the maximum financially feasible price for a new investment given the annual amount available to support additional debt, they may use the short version on this spreadsheet shown below.

ABLILTY TO PAY FOR NEW INVESTMENTS
Short Version

1)	Amount Available to Support Additional Debt	17,500
2)		
a)	Present Value of $1 Annuity	4.1002
b)	Number of Years	5
c)	Interest Rate	7.0%
3)	= Amount of Additional Debt Available Funds will Support	71,753
4)	+ Equity Available for Downpayment	20,000
5)	= Maximum Financially Feasible Price for New Investment	91,753

TAX IMPLICATIONS

The acquisition of machine services can have significant tax and other financial implications. Although I leave most tax issues for the producer's accountant to handle, I do go over some scenarios, such as the following, in an effort to stress to producers the need to be aware of tax and financial implications associated with machinery management.

> Suppose you are operating in the 25% marginal tax bracket. In 1982, you purchased a tractor for $35,000. Over the next twelve years this tractor was depreciated to zero value on your books. In 1994, you trade-in this tractor, plus $30,000 cash, on a tractor valued at $55,000. Over the next twelve years this tractor is depreciated to zero value on your books. In 2006, you decide to trade-in this tractor on a tractor valued at $85,000 for the trade-in plus $35,000 that will be borrowed from the bank. Your neighbor comes to you and says, "I'll purchase your old tractor from you for $50,000." What do you do?

What may seem like a break-even trade off between the two alternatives does have some significant tax and financial implications. Based on the sales tax rules of Washington State, if the producer decides to go with the trade-in, the actual cash outlay for the producer, assuming a 7.5% sales tax, is $37,625 ($35,000 x 1.075). If a five-year, 9% annual interest loan is obtained from the bank to cover this outlay, the annual principal and interest payments will be $9,673 per year for five years and the beginning book value of the machine will be $37,625.

If the producer decides to sell the tractor to his neighbor for $50,000 and then purchase the new tractor for $85,000, income tax in the amount of $12,500 will have to be paid on the depreciation recapture amount of $50,000 leaving the producer with $37,500 cash. Washington State sales tax of 7.5% will have to be paid on the entire purchase price of $85,000 making the actual cash outlay for the tractor $91,375 ($85,000 x 1.075 = $91,375). Assuming the entire $37,500 cash netted from the sale of the older tractor goes toward a down payment on the newer tractor, a total of $53,875 will need to be borrowed from the bank. If a five-year, 9% annual interest loan is obtained from the bank to cover this outlay, the annual principal and interest payments will be $13,851 per year for five years and the beginning book value of the machine will be $91,375.

What is actually the best alternative for the producer depends on several different factors. However, what this example does illustrate is that what might seem like a simple machinery management decision may actually contain hidden costs if the manager is not aware.

COST OF OPERATING MACHINERY

Surprisingly, most producers do not know how much their machinery is costing them to operate when it comes to specific operations. To determine their own individual costs, there is no good substitute for a good set of records. However, since most producers do not have detailed enough records to calculate these individual costs, the MACHCOST program developed by the University of Idaho can be used to help producers get a reasonable estimate as to their cost of operating machinery.

Suppose that a producer wants to get an estimate as to what it costs to bale 1-ton rectangular bales with his/her current equipment. To use the MACHCOST program, initiate the program and select the power unit and implement for which the analysis is desired. In this example, it is assumed that a 185-HP, 4-wheeled drive tractor is being used to pull the rectangular baler. As can be seen in Figure 1, the tractor was purchased for $80,000. At time of purchase the tractor was seven years old and the current list price of a new tractor is $125,000. The annual repair costs, salvage value and gallons of fuel used per hour can be calculated by the program using equations developed by the American Society of Agricultural Engineers or the user may use his/her own figures. The rest of the entries are self explanatory.

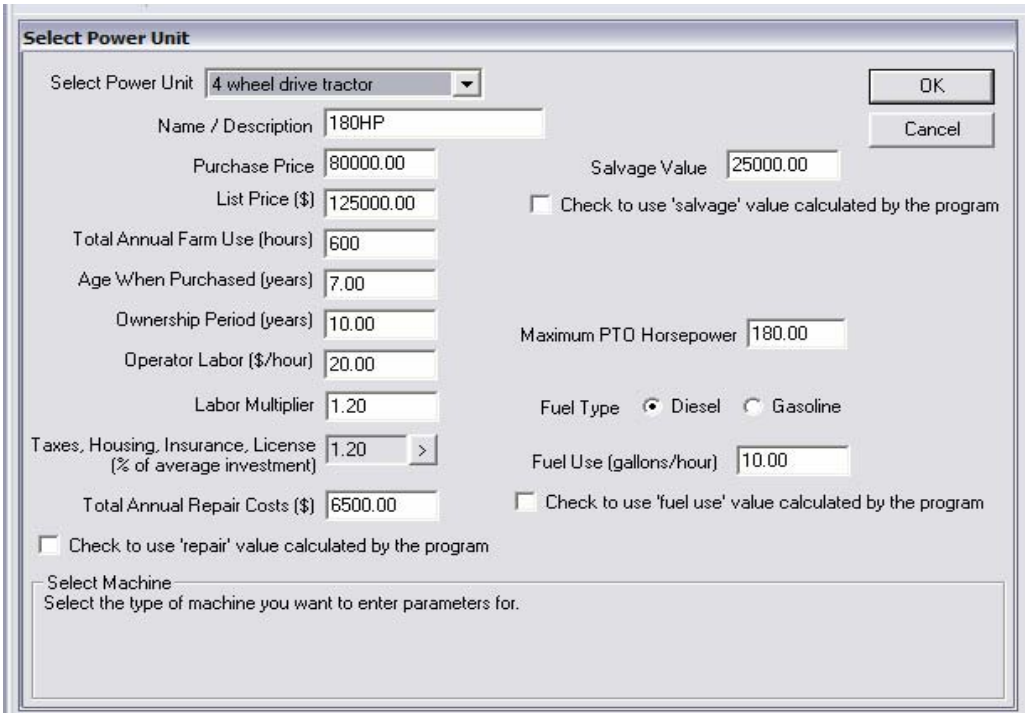

Figure 1: MACHCOST data entry for 180HP-4-wheel tractor.

The same can be said for the rectangular baler as shown in Figure 2.

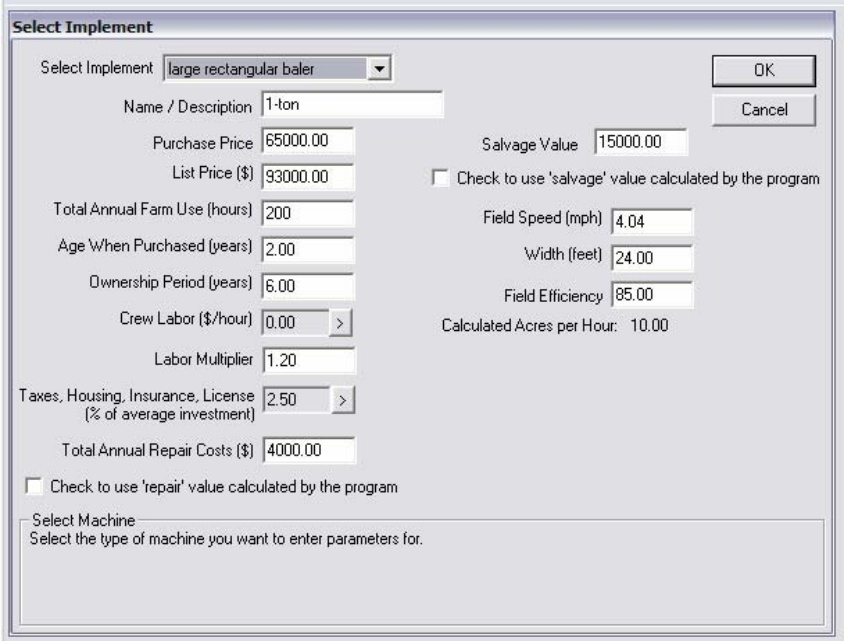

Figure 2: MACHCOST data entry for 1-ton rectangular baler.

Figure 3 shows the resulting output from the MACHCOST program on both an hourly basis and a per acre basis. If the producer is most interested in knowing the cost on a per 1-ton bale basis, the resulting per acre cost of $16.94 would need to be divided by the average number of tons baled per acre. For instance, if these figures were based on one and one-half tons per acre being baled, the cost per ton would be $11.29 ($16.94/1.5) per ton.

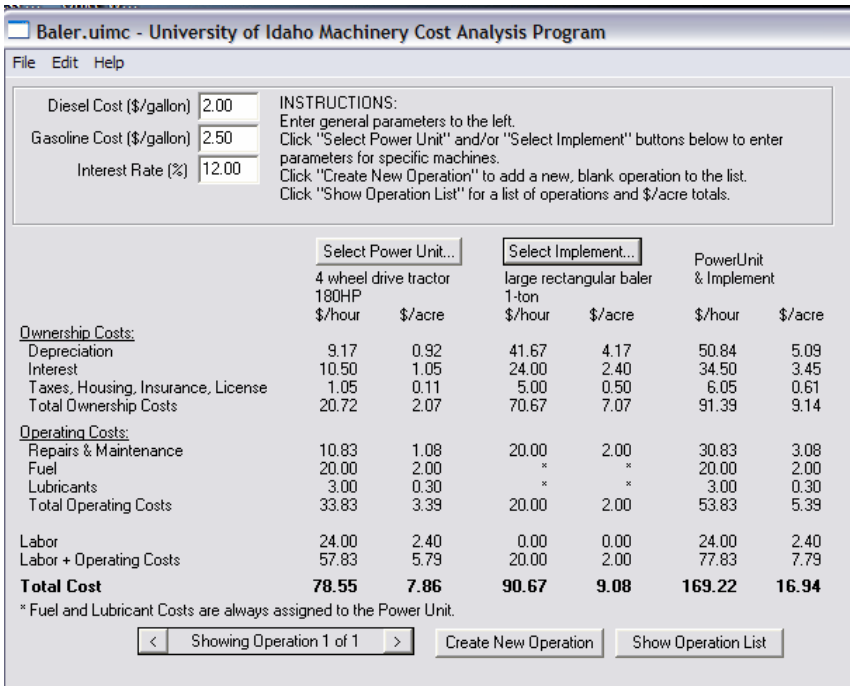

Figure 3. Example results from MACHCOST computer program.

COST OF CUSTOM SERVICES

The question I am most often asked concerning machinery management is, "What should I charge for custom services?"

My general reply has been, "What is it costing you to do custom services?"

The current market in the area often determines the price for custom work. However, producers that do custom work often find that the current market price for custom services does not cover the cost of owning and operating machinery, plus receiving the desired profit margin for the risk involved in the venture. To help producers estimate what they should be charging for custom services, numerous years ago I developed a set of hand worksheets producers could use to estimate the custom rate an operator needs to receive in order to cover the cost of owning and operating machinery, plus receiving the desired profit margin for the risk involved in the venture. This series of worksheets eventually ended up as a spreadsheet program called CUSTOM.

The cost involved in owning and operating machinery are those of replacement; interest; taxes, insurance and housing; repair and maintenance; fuel and lube; and labor. Costs that occur regardless of the amount a machine is used during any one year are replacement cost; interest cost; and taxes, insurance and housing costs.

Replacement costs are not the same as a depreciation allowance. If replacement cost determination is based on the original cost of the equipment, when it comes time for replacement, one is likely to find that these costs understate what is needed to replace the original machine. Therefore, annual replacement costs in the CUSTOM program are calculated as follows:

> (Replacement value of equipment item – Expected value of current equipment item at time of sale or trade) / Number of years the equipment item is kept before being sold or traded.

Interest costs are calculated on the value of the equipment item currently owned. Therefore, annual interest costs in the CUSTOM program are calculated as follows:

> Value of current equipment item x Annual interest rate.

The annual interest rate most often used in the CUSTOM program is that the producer believes to be the return that could be derived from the next best alternative investment.

Taxes, insurance and housing, along with the operation costs that depend directly on how much the equipment is operated annually (repair and maintenance, fuel and lube, and operating labor) are given amounts supplied by the producer. Once the equipment ownership and operation costs are estimated, one needs to include the profit margin desired by the operator.

The use of the CUSTOM program will be briefly illustrated by the use of an example. Joe Custom farms his own operation and regularly bales extra acreage on a custom basis. Joe uses

three pieces of equipment in his custom operation; a180 horsepower 4-wheel drive tractor, a 1-ton rectangular baler, and a ¾ ton 4-wheel drive pickup. For every hour of machine operation, 1.2 hours of labor are used. Labor cost, including benefits, is $20.00 per hour. The prevailing interest rate is 12% (estimated return on alternative investments). In addition, a profit margin of 20% over and above all costs is desired. All other relevant data are presented in the following illustrative spreadsheets.

Figure 4 shows the cost of operating the 180 horsepower 4-wheel drive tractor both on a per hour basis and a per acre basis under the given assumptions. The $1,000 of annual property tax also covers estimated annual insurance cost and annual housing and shop cost.

Tractors or Self-Propelled Equipment	
Description:	180HP 4WD Tractor
Total Hours Used Annually	600
Value of Equipment Item Currently Owned	$80,000
Expected Value of Equipment Item at Time of Sale or Trade (Today's Prices)	$25,000
Replacement Cost of Equipment Item (Today's Prices)	$125,000
Number of Years Item is Kept Before Trade-In	10
ANNUAL REPLACEMENT COST	$10,000.00
Interest Rate (Percentage)	12.0%
ANNUAL INTEREST EXPENSE	$9,600
Annual Property Tax	$1,000
Annual Insurance Cost	$0
Annual Housing and Shop Cost	$0
Annual Repair and Maintenance Cost	$6,500
Annual Fuel and Lube Cost	$13,800
ANNUAL COST OF OWNERSHIP AND OPERATION	$40,900
Accomplishment Rate (Acres Per Hour)	10.00
OWNERSHIP AND OPERATION COST PER HOUR	$68.17
OWNERSHIP AND OPERATION COST PER ACRE	$6.82

Figure 4: Cost of operating 180HP 4-WD tractor.

Figure 5 shows the cost of operating the rectangular baler both on a per hour basis and on a per acre basis. The $1,000 of annual property tax also covers estimated annual insurance cost and annual housing and shop cost.

Tillage or Non-Self-Propelled Equipment	
Description:	Retangular Baler (1-ton bales)
Total Acres Covered Annually	2,000
Value of Equipment Item Currently Owned	$65,000
Expected Value of Equipment Item at Time of Sale or Trade (Today's Prices)	$15,000
Replacement Cost of Equipment Item (Today's Prices)	$93,000
Number of Years Equipment Item is Kept Before Trade-In	6
ANNUAL REPLACEMENT COST	$13,000
Interest Rate (Percentage)	12.0%
ANNUAL INTEREST EXPENSE	$7,800
Annual Property Tax	$1,000.00
Annual Insurance Cost	$0.00
Annual Housing and Shop Cost	$0.00
Annual Repair and Maintenance Cost	$4,000.00
Annual Fuel and Lube Cost	$0.00
ANNUAL COST OF OWNERSHIP AND OPERATION	$25,800
Accomplishment Rate (Acres Per Hour)	10.00
OWNERSHIP AND OPERATION COST PER ACRE	$12.90
OWNERSHIP AND OPERATION COST PER HOUR	$129.00

Figure 5: Cost of operating rectangular baler.

Figure 6 shows the cost of operating the ¾ ton pickup on both a per mile and a per acre basis.

Pickup or Truck	
Description:	3/4 Ton Pickup
Miles of Annual Use	15,000
Value of Truck Currently Owned	$15,000
Expected Value of Truck at Time of Sale or Trade (Today's Prices)	$5,000
Replacement Cost of Truck (Today's Prices)	$28,000
Number of Years Truck is Kept Before Trade-In	7
ANNUAL REPLACEMENT COST	$3,286
Interest Rate (Percentage)	12.0%
ANNUAL INTEREST EXPENSE	$1,800
Annual Property Tax and Licensing Fee	$300
Annual Insurance Cost	$500
Annual Housing and Shop Cost	$340
Annual Repair and Maintenance Cost	$1,400
Annual Fuel and Lube Cost	$3,500
ANNUAL COST OF OWNERSHIP AND OPERATION	$11,126
OWNERSHIP AND OPERATION COST PER MILE	$0.74
Miles of Use for this Activity	3,000
TOTAL ANNUAL COST FOR THIS ACTIVITIY	$2,225.14
Acres of This Activity	2,000
OWNERSHIP AND OPERATION COST PER ACRE	$1.11

Figure 6: Cost of operating ¾ ton pickup.

Figure 7 shows the summary of the cost of operating the various equipment implements associated with baling hay on a custom basis. In addition, by adding the labor hours required per machine hour, labor cost per hour, and the desired profit margin, the custom rate that should be charged on both a per acre basis and a per hour basis are calculated.

Custom Rate Calculation and Summary		
Description:	Custom Baling	
Machinery Items:		Cost/Acre
Item:	180HP 4WD Tractor	$6.82
Item:	Retangular Baler (1-ton bales)	$12.90
Item:		$0.00
Item:	3/4 Ton Pickup	$1.11
Item:		$0.00
PER-ACRE OWNERSHIP AND OPERATION COSTS		$20.83
Labor Costs:		
Accomplishment Rate (Acres Per Hour)		10.00
Labor Hours Required Per Machine Hour		1.20
Labor Cost Per Hour		$20.00
PER-ACRE LABOR COSTS		$2.40
Profit Margin (Percentage)		20.0%
PER-ACRE PROFIT MARGIN		$4.65
ESTIMATED CUSTOM RATE PER ACRE		$27.88
ESTIMATED CUSTOM RATE PER MACHINE HOUR		$278.75

Figure 7: Summary of estimated cost of custom baling.

If you should want the cost per ton of baling hay, you need to divide the custom rate per acre by the average number of tons per acre baled under the above circumstances. For instance, if the average tons baled per acre is 1.5, the cost per ton would be $18.59 ($27.88/1.5). If the average tons baled per acre is 2.0, the cost per ton would be $13.94 ($27.88/2.0).

It needs to be noted that the figures used in the above example are for illustration purposes only. The calculated result from this example does not necessarily represent the true cost for a custom operator baling hay.

In summary, the rate a supplier of custom services needs to receive to cover all costs, plus receive a desired profit margin, will vary as to the size of equipment used, equipment life, annual hours of equipment use, if replacements are made with new or used equipment, cost of labor, desired profit margin, and the specific situation facing the operator. If a supplier of custom services receives less that the calculated rate, the profit margin is being reduced and/or additional cost of equipment ownership must be covered by other sources.

The computer programs discussed in this presentation, along with accompanying information, can be downloaded by going to the Washington State University Farm Management web site at http://www.farm-mgmt.wsu.edu and clicking on “2006 Alfalfa Conference.”