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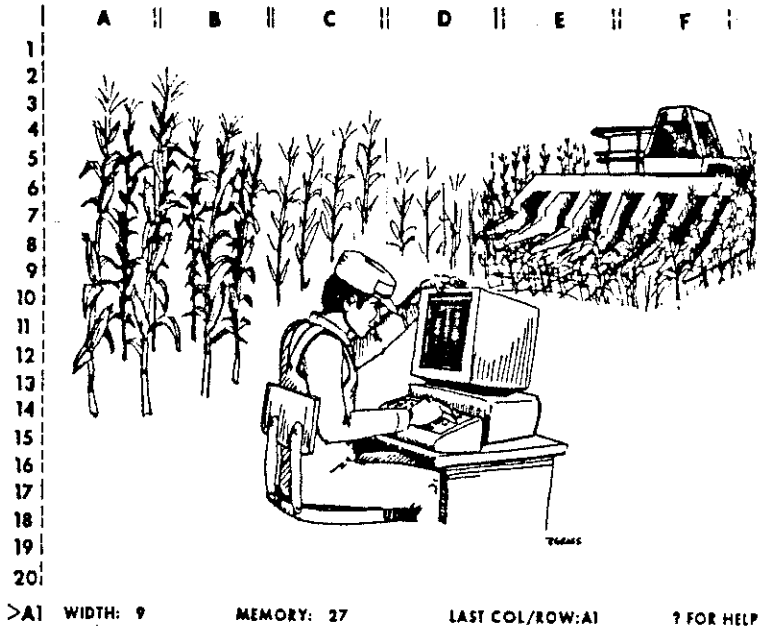
# CUSTOM RATE ESTIMATOR TEMPLATE




by

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# CUSTOM RATE ESTIMATOR TEMPLATE
Version 1.1

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The purpose of the custom rate estimator is to estimate a breakeven custom rate for a tractor or other power unit and up to 3 implements, needed to cover added operating and ownership expenses. A self-propelled combine should be entered as a power unit and the heads as implements with their own effective widths and speeds. The template is designed to cover a situation where the machines are already owned and used in an ongoing farm operation, or for purposes other than doing custom work. It can also be used to estimate a breakeven custom rate you can afford to pay as an alternative to purchasing a new machine.

Operating costs that should be considered in setting a custom rate include fuel, extra repairs, labor and miscellaneous expenses such as twine. Repair costs per hour tend to increase as hours of use accumulate. The other operating costs tend to stay fairly constant on an hourly basis.

If a machine is going to be owned whether used for custom work or not, and if the custom work does not conflict with time needed to get other field operations done, then covering ownership costs may be less important in the decision to do custom work. The farm will incur the annual ownership costs of depreciation, interest on investment, insurance and storage anyway, so farm income will be increased by charging any amount that exceeds operating costs, even if ownership costs are only partially covered. On the other hand, if a machine is purchased only to do custom work, all ownership and ownership costs need to be covered for the purchase to increase farm income. If a new machine is purchased to be used both on the farm and for custom work, it is less clear how much of ownership costs to allocate to the custom rate.

Several breakeven custom rates are calculated to address these scenarios:

1. The amount needed to cover operating costs only, for machines that are going to be owned for other purposes,

2. All ownership and operating costs, for a situation where both the tractor or power unit and implements will be purchased to do custom work and not purchased otherwise. Another situation where this rate would apply is where hiring someone else to do your work on a custom basis as an alternative to buying your own machines.

3. For machines purchased for both custom work and work on your own farm, the third rate includes a share of ownership costs equal to the share of annual use that is custom work, and

4. Last, a rate that includes ownership costs for implements but not the tractor. This was included for a situation where the implement is used primarily for custom work but the tractor is used for other purposes.

Methods Used to Calculate Costs

Repair, maintenance, fuel and oil costs can be estimated from engineering formulas or entered directly on a per acre basis if that information is available. To use the engineering formulas, enter the PTO horsepower for the power unit, a fuel price per gallon and a fuel and oil coefficient for the type of fuel used. Enter an estimated wearout life from Table 1 and repair group number from Table 2. Repair costs also depend on the list price, which should be the price in the current year. Ownership costs are based on the purchase price. This should be the price actually paid. Accumulated hours at purchase, for tractors, and years old at purchase, for implements, are used in the repair cost calculation.

Repair costs are calculated with and without the extra custom work. The tractor annual non-custom hours of use and normal acres covered per year are used to calculate repair costs without custom work. New acres covered per year are used to calculate extra repairs resulting from the custom work.

To enter repair, maintenance, fuel and oil costs per acre dirctly, you must set the calculated costs to zero. Set fuel and oil to zero by entering a zero fuel coefficient. Set calculated repair and maintenance costs to zero by entering a zero for the repair group number. Then enter your costs per acre in lines 55 and 57. Lines 58 to 64 are provided for other costs you may wish to enter directly, such as additional labor apart from the tractor driver, timeliness losses from the custom work being done in a less timely manner, transportation and miscellaneous costs.

Field Capacity

If using the engineering formulas, the time required to cover an acre is the first calculation for each machine. This is called its "field capacity". The field capacity of a machine is a function of the machine capacity, field efficiency and operating speed. Machine capacity is the width of the machine. For example, with a grain combine, it is the width of the grain head. For a corn planter, machine width is the number of rows times the row spacing.

Field efficiency is the percentage of the theoretical field work accomplished after deducting for losses resulting from failure to use the full width of the machines, turning and idle travel at the ends, clogging, filling and adjusting seed, fertilizer and spray materials, unloading harvested crops, machine adjustments and minor repairs, lubrication, and other minor interruptions. It excludes waiting for supplies, wagons or trucks, major breakdowns, and daily service activities. Field efficiency for a particular machine varies with the size and shape of the field, field

obstructions, pattern of the field operation, crop yield, moisture and crop conditions. The size of the machine also influences the field efficiency. Efficiency is reduced as larger machines are used. For example, the efficiency of corn planters and corn tillage tools is reduced about one percent for each row added, discs about one percent for each 30 inches of added width and moldboard plows about two percent per bottom added.

The speed of the implement is influenced by the size of power unit, the draft of the implement, the physical characteristics of the land, and the dexterity of the operator. Generally, the effective speed of the implement determines the rate of travel.

The time required to cover an acre is computed by using the following formula:

$$\text{Hours/acre} = \frac{8.25}{\text{width(ft.)} \times \text{speed (m.p.h.)} \times \text{field efficiency (decimal)}}$$

Typical speeds and field efficiencies are shown in Table 1.

Operating and Ownership Costs

Costs of using new or used machinery can be categorized into two groups, operating or variable costs and ownership or fixed costs. Operating costs include fuel and lubrication, repairs and labor. Ownership costs include depreciation, interest, taxes, insurance and housing.

Operating Costs

Accumulated repair costs for different types of machines at any point in their useful lives is estimated in a formula. Years owned are first multiplied by annual hours of use to give accumulated hours of use. List price of the machine is used to relate repair cost to the cost of the machine. The formula is:

$$\text{accumulated repair cost} = 0.01 \times P \times a \times \left(\frac{H \times 100}{u}\right)^{b}$$

P = List price
H = Accumulated hours of use
u = Estimated wearout life in hours (from Table 1)
a = Repair coefficient 1 (from Table 2)
b = Repair coefficient 2 (from Table 2)

For used machines, repair cost over years owned is calculated by subtracting accumulated repairs at purchase from accumulated repairs at end of years owned. The repair cost over years owned is then divided by hours of use to get an average repair cost per hour. Values for Repair 1 and Repair 2 are given in Table 2 for different types of machines.

Fuel and lubrication costs depend on the nature of the job being performed, the size of the unit, and the type of fuel used. Average annual fuel consumption in gallons per hour, based on University of Nebraska tractor test data, was estimated as follows (Sprague, et al.):

gasoline = 0.06 x maximum p.t.o.h.p.
diesel fuel = 0.0438 x maximum p.t.o.h.p.
L.P. gas = 0.072 x maximum p.t.o.h.p.

For individual operations, fuel consumption may vary considerably from the average. For plowing the consumption may be increased by about one-third. Costs of oil, lubricants, and oil filters approach about 15 percent of the fuel cost.

The costs of fuel, oil and lubricants per hour are calculated as follows:

fuel and lubricants = fuel coefficient x maximum p.t.o.h.p. x fuel cost x fuel multiplier

where the fuel coefficient is entered for the type of fuel used by the tractor or self-propelled power unit and the fuel multiplier is used to adjust fuel consumption up or down for a particular operation. Estimated fuel coefficients based on the Nebraska data and the 15 percent allowance for lubricants are:

| | |
|---|---|
| gasoline and lubricants | 0.0690 |
| diesel fuel and lubricants | 0.0504 |
| L.P. gas and lubricants | 0.0828 |

Suppose a diesel tractor is used for plowing, planting corn and raking hay. Enter a fuel coefficient of 0.0504 for the tractor. To increase fuel consumption for plowing, enter 1.33 as a fuel multiplier for the plow. Enter a fuel multiplier of 1.0 for normal fuel use in planting corn. To decrease fuel consumption for raking hay, enter a multiplier less than 1.0, such as 0.67.

Table 1. Farm Machinery Characteristics

| | Speed (mph) | Field Efficiency (decimal) | Estimated Life (hours) |
|---|---|---|---|
| Moldboard or disc plow | 3.5-6.0 | 0.70-0.90 | 2,500 |
| Chisel plow | 4.0-6.5 | 0.70-0.90 | 2,500 |
| Subsoiler | 3.0-5.0 | 0.70-0.90 | |
| Land plane | | | 2,500 |
| Powered rotary tiller | | | |
| 3-4 inch increment of cut | 1.0-5.0 | 0.70-0.90 | 2,500 |
| Harrow, single disc | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Harrow, tandem disc | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Harrow, offset or heavy tandem disc | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Harrow, spring tooth | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Harrow, spike tooth | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Cultipacker | 4.5-7.5 | 0.70-0.90 | 2,500 |
| Rotary hoe | 5.0-10 | 0.70-0.85 | 2,500 |
| Rod weeder | 4.0-6.0 | 0.70-0.90 | 2,500 |
| Field cultivator | 3.0-8.0 | 0.70-0.90 | 2,500 |
| Field cultivator - heavy clay | 3.0-8.0 | 0.70-0.90 | 2,500 |
| Row crop cultivator | 3.0-6.0 | 0.70-0.90 | 2,500 |
| Fertilizer spreader | | | |
| Pull type | 3.0-5.0 | 0.60-0.75 | |
| Anhydrous ammonia applicator | 3.0-6.0 | 0.60-0.75 | |
| Field sprayer | 3.0-5.0 | 0.50-0.80 | |
| Manure spreader, beaters | | | 2,500 |
| Manure spreader, chain flails | | | 2,500 |
| Manure spreader, liquid | | | 2,500 |
| Corn or soybean planter, drilling seed only | 3.0-6.0 | 0.50-0.85 | 1,200 |
| Corn or soybean planter, with all attachments | 3.0-6.0 | 0.50-0.85 | 1,200 |
| No-till corn planter | 3.0-5.0 | 0.50-0.75 | 1,200 |
| Grain drill | 2.5-6.0 | 0.65-0.85 | 1,000 |
| Mower | 5.0-7.0 | 0.75-0.85 | 2,500 |
| Mower-conditioner (cutterbar) | 4.0-6.0 | 0.60-0.85 | 2,000 |
| Mower-conditioner (flail) | 4.0-6.0 | 0.60-0.85 | 2,000 |
| S.P. mower-conditioner | 3.0-6.0 | 0.55-0.85 | 2,500 |
| Rotary mower; horizontal blade | 3.0-8.0 | 0.75-0.85 | 2,000 |
| Conditioner only | 5.0-7.0 | 0.75-0.85 | 2,500 |
| Side Delivery Rake | 4.0-5.0 | 0.70-0.85 | 2,500 |
| Baler, pto | 2.0-4.0 | 0.60-0.85 | 2,500 |

Table 1. Farm Machinery Characteristics (cont.)

| | Speed (mph) | Field Efficiency (decimal) | Estimated Life (hours) |
|---|---|---|---|
| Flail type forage harvester in green forage | 2.0-4.5 | 0.50-0.75 | 2,000 |
| Forage harvester (pull-type) | | | 2,000 |
| Green forage | 2.0-4.5 | 0.50-0.75 | |
| Wilted forage | 2.0-4.5 | 0.50-0.75 | |
| Dry Hay | 2.0-4.5 | 0.50-0.75 | |
| Corn silage | 2.0-4.5 | 0.50-0.85 | |
| Recutter & wilted forage | 2.0-4.5 | 0.50-0.75 | |
| S.P. forage harvester windrower, small grain | 5.0-7.0 | 0.75-0.85 | 2,000 |
| PTO combine, wheat | 2.0-4.0 | 0.65-0.80 | 2,000 |
| S.P. combine | 2.0-4.0 | 0.65-0.80 | 2,000 |
| Corn head | | | 2,000 |
| Corn Picker | | | 2,000 |
| 1-row trailed | 2.0-4.0 | 0.60-0.80 | |
| 2-row trailed | 2.0-4.0 | 0.60-0.80 | |
| Beet Topper | 2.0-3.0 | 0.60-0.80 | 2,000 |
| Sugar beet harvester | 3.0-5.0 | 0.60-0.80 | 2,500 |
| Forage blower | | | 2,000 |
| wilted hay crop | 20-30T/hr. | | |
| corn or grass silage | 20-50T/hr. | | |
| Tractor, 2-wheel drive | | | 12,000 |
| Tractor, 4-wheel drive | | | 12,000 |
| Tractor, crawler | | | 12,000 |
| Truck, farm | | | 2,000 |
| Truck, pickup | | | 2,000 |
| Front end loader | | | 2,500 |
| Wagon and box | | | 5,000 |
| Wagon, feed | | | 2,500 |

SOURCE: P. R. Sprague, W. A. Knoblauch, and R. A. Milligan. Profitable Combinations of Cash Crop Enterprises - Objectives and Procedures of a Sequential School Extension Program. A.E. Ext. 80-7, Department of Agricultural Economics, Cornell University, March 1980, and American Society of Agricultural Engineers, 1975. Agricultural Engineers Yearbook, pp. 347-54, St. Joseph, Michigan.

Table 2. Repair and Maintenance Cost Coefficients for Farm Machinery

| Repair Group # | Machine | Repair 1 | Repair 2 |
|---|---|---|---|
| 1 | 2-Wheel Drive Tractors | .120 | 1.5 |
| 2 | 4-Wheel Drive & Crawler Tractors | .100 | 1.5 |
| 3 | Tillage Tools, Rotary Hoe, Cutterbar, Mower, Cultivator, Cultipacker | .301 | 1.3 |
| 4 | Fertilizer Equipment | .191 | 1.4 |
| 5 | Self-Propelled Combine, Self-Propelled Forage Harvester, Pickup Truck, Manure Spreader, Front End Loader | .096 | 1.4 |
| 6 | P.T.O. Baler, Corn Picker, Forage Blower, Sprayer, Pull Type Forage Harvester | .127 | 1.4 |
| 7 | Corn Planter, Grain Drill, Mower Conditioner, Rake, Wagon | .159 | 1.4 |

SOURCE: American Society of Agricultural Engineers, 1975 Agricultural Engineers Yearbook, pp. 347-54. St. Joseph, Michigan.

Ownership Costs

Depreciation is the decline in value over the life of the machine. For tax purposes depreciation can be computed by the straight line method, the sum of digits method or the declining balance method. Assuming a reasonable salvage value, which method of depreciation will give the greatest amount of depreciation over the life of the machine? Each method will give the same amount of depreciation over the life of the machine. Furthermore, if a farmer depreciates a machine to a very low salvage value and then trades for another machine, the new machine will have a lower cost to be depreciated over its life. However, the actual total depreciation can never be known until the machine is sold or traded. With recent price increases for new machinery, many used items sell for prices greater than their original purchase price. Straight-line depreciation is the method used in the template.

Interest on investment is the annual interest charge on the undepreciated value of machinery. Many farmers do not think of interest as a cost unless they borrow money to purchase a machine. Even though money is not borrowed, interest charges should be considered because funds could be invested elsewhere and earn a return.

Insurance must be included as a cost of operation. Liability coverage should be included because tractors and other machinery may be involved in accidents resulting in liability claims. There may also be losses as a result of fire or high winds. Generally, farmers do not insure individual machines, but have a blanket policy. A common rate is $5 per $1000 valuation or 0.5 percent of the remaining value at the beginning of the year.

Housing or storage is another cost of using machinery. Some machinery repair indicate that housing may increase the life of the machine, which in turn may be reflected in the trade-in value. Typical housing costs are 1.5% of the beginning yearly value.

Taxes are levied against personal property in some states. New York does not have a personal property tax.

V1.1 December 4, 1986 Repair and Maintenance Coefficients

CUSTOM RATE ESTIMATOR

Purpose - Estimates custom rates per acre for a tractor or other powe unit and up to 3 implements needed to cover added operating and ownership expenses, for a situation where the machines are already owned for other purposes. Can also be used to estimate highest custom rate to pay instead of purchasing new machines.

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Press [PgDn] to continue

| | COEF1 |
|---|---|
| 0 | 0 |
| 1 | 0.12 |
| 2 | 0.1 |
| 3 | 0.301 |
| 4 | 0.191 |
| 5 | 0.096 |
| 6 | 0.127 |
| 7 | 0.159 |

| | COEF2 |
|---|---|
| 0 | 1.0 |
| 1 | 1.5 |
| 2 | 1.5 |
| 3 | 1.3 |
| 4 | 1.4 |
| 5 | 1.4 |
| 6 | 1.4 |
| 7 | 1.4 |

| TRACTOR INFORMATION | | FARM INFORMATION | |
|---|---|---|---|
| Tractor Type | 80 hp tractor | Interest Rate | 10.0% |
| | | Insurance Rate | 0.5% |
| Purchase Price | $15,000 | Storage Rate | 0.5% |
| List Price | $25,000 | Labor Rate $/hr. | $6.00 |
| PTO HP | 80 | | |
| Fuel price | $1.00 | | |
| Fuel,oil coef | 0.0504 | | |
| Repair Group # | 1 | | |
| estim life (hrs) | 12,000 | | |
| Accum. Hrs at Purchase | 5,000 | | |
| Annual Non-Custom Hr | 400 | <= Hrs without implements being | |
| Labor Hrs % of Tractor | 120% | considered below | |

IMPLEMENT INFORMATION

| Implement Type | Manure spreader | Impl. name | Impl. name |
|---|---|---|---|
| Purchase Price | $9,000 | $0 | $0 |
| List Price | $10,000 | $0 | $0 |
| Width in Feet | 10 | 0 | 0 |
| Speed in MPH | 2 | 0 | 0 |
| Field Efficiency | 70% | 0% | 0% |
| Fuel Multiplier | 1 | 0 | 0 |
| Repair Group # | 5 | 0 | 0 |
| estim life (hrs) | 2,500 | 0 | 0 |
| Years Old at Purchase | 0 | 0 | 0 |
| Tractor Hrs % of Impl | 105% | 0% | 0% |
| If you already own impl and are considering extra work: | | | |
| Normal Acres Covered/Year | 0 | 0 | 0 |
| New Acres Covered/Year | 300 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| COSTS ENTERED DIRECTLY ON A PER ACRE BASIS | | | | |
| Extra fuel provided - enter 0 for fuel coefficient in cell C28 | | $0.00 | $0.00 | $0.00 |
| Repairs & maintenance - enter 0 for repair group # in row 44 | | 0.00 | 0.00 | 0.00 |
| Additional labor costs | | 0.00 | 0.00 | 0.00 |
| Harvesting losses | | 0.00 | 0.00 | 0.00 |
| Timeliness | | 0.00 | 0.00 | 0.00 |
| Transportation | | 0.00 | 0.00 | 0.00 |
| _____ | | 0.00 | 0.00 | 0.00 |
| _____ | | 0.00 | 0.00 | 0.00 |

| RESULTS | Tractor | -------- Implements -------- | | |
|---|---|---|---|---|
| Impl Hrs/A | | 0.6 | 0.0 | 0.0 |
| Tractor Hrs/A | | 0.6 | 0.0 | 0.0 |
| Labor Hrs/A | | 0.7 | 0.0 | 0.0 |
| Repair Coef 1 | 0.12 | 0.096 | 0.000 | 0.000 |
| Repair Coef 2 | 1.5 | 1.4 | 1.0 | 1.0 |
| Hrs Use/Yr | 586 | 177 | 0 | 0 |
| Accum Hrs at Purchase | 5,000 | 0 | 0 | 0 |
| ENTER ==========> | | | | |
| Yrs Owned w/o new acres | 6 | 5 | 0 | 0 |
| Salvage% of Pur Price | 40% | 10% | 0% | 0% |
| Yrs Owned with new acres | 5 | 4 | 0 | 0 |
| Salvage% of Pur Price | 40% | 10% | 0% | 0% |
| RESULTS | | | | |
| Accum Hrs Over Life w/o new acres | 7,400 | 0 | 0 | 0 |
| Accum Hrs Over Life with new acres | 7,928 | 707 | 0 | 0 |
| Accum R&M Cost over life w/o new acres | $14,528 | $0 | $0 | $0 |
| Accum R&M Cost over life with new acres | 16,110 | 1,034 | 0 | 0 |
| Estimated Fuel Cost $/Hr | 4.03 | 4.03 | 0.00 | 0.00 |
| Added Impl R&M Cost/Hr | | 1.17 | 0.00 | 0.00 Total |
| Added Trac R&M Cost/Hr | 1.42 | 1.49 | 0.00 | 0.00 All Machines |

| | | | | |
|---|---|---|---|---|
| FUEL COST PER ACRE | 2.38 | 0.00 | 0.00 | 2.38 |
| IMPL REPAIR & MAIN. COST/A (calc) | 0.69 | 0.00 | 0.00 | 0.69 |
| TRACTOR R & M COST/A (calc) | 0.92 | 0.00 | 0.00 | 0.92 |
| R & M COST/A from line 57 | 0.00 | 0.00 | 0.00 | 0.00 |
| LABOR COST/A | 4.46 | 0.00 | 0.00 | 4.46 |
| OTHER COSTS/A | 0.00 | 0.00 | 0.00 | 0.00 |
| TOTAL OPERATING COST/A | 8.44 | 0.00 | 0.00 | 8.44 |
| TOTAL OPERATING COSTS | 2,533.04 | 0.00 | 0.00 | 2,533.04 |
| Acres | 300 | 0 | 0 | |

TOTAL OWNERSHIP COSTS

| | Tractor | -------- Implements -------- | | | |
|---|---|---|---|---|---|
| DEPRECIATION | 1500 | 1620 | 0 | 0 | 3120 |
| INTEREST | 1050 | 495 | 0 | 0 | 1545 |
| INSURANCE | 52.5 | 24.75 | 0 | 0 | 77.25 |
| STORAGE | 52.5 | 24.75 | 0 | 0 | 77.25 |
| TOTAL OWN. COST/YR. | $2,655 | $2,165 | $0 | $0 | $4,820 |

| | | | | | |
|---|---|---|---|---|---|
| % OF PUR PRICE | 18% | 24% | ERR | ERR | |
| Hrs. Custom Work/Yr. | 186 | 177 | 0 | 0 | |
| Custom work % of total annual hrs. of use | 32% | 100% | 0% | 0% | |
| Custom Rates Needed to Cover: | | | | | |
| Operating Costs Only | | $8.44 | $0.00 | $0.00 | $8.44 |
| All Own&Oper Costs | | 24.51 | 0.00 | 0.00 | 24.51 |
| Share of Ownership Costs Based on Hrs of Use | | 18.46 | 0.00 | 0.00 | 18.46 |
| Impl Own& Oper Costs, Tractor Oper Costs Only | | 15.66 | 0.00 | 0.00 | 15.66 |