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NebGuide

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Cost Estimation—Field Operations

Robert E. Perry, Extension Farm Management Specialist

Prices for farm machinery, repairs, and fuel and oil are constantly changing. This NebGuide provides farm operators and/or custom operators with a simplified method of estimating costs of owning and operating machinery that is based on current prices.

It should be recognized that the use of simplified methods provides an approximate answer. Factors used to estimate "ownership" and "repair" costs are based on averages from more detailed farm machinery studies. The average annual cost factors in *Tables 1* and *2* at the bottom of the cost estimation form are expressed as decimal factors. List price times the proper factor estimates the annual cost.

Table 1: Ownership or Fixed Costs

The costs of depreciation, interest, insurance and housing are assumed by the buyer when the purchase of a capital item (machine) is made. They are called *ownership* or *fixed costs,* and are annual costs whether the machine is used or not. Consequently, they decrease on a per unit basis with increasing use. Annual fixed cost rates vary between types of machines, maintenance or care, and years held. The only division made on rates in *Table 1* is for varying types of machinery. An annual interest rate of 12 percent is assumed.

Table 2: Operating or Variable Costs

Costs incurred as a machine is used are *operating* or *variable costs.* These include fuel, lubrication, repairs and labor. They do not decrease on a per unit basis with increased use. They do vary, however, with machine size, load, kind of fuel and field efficiency.

Table 2 expresses average repair rates per year for different machine types as a decimal factor. Other variable costs are calculated as steps in the budgeting process on the form.

Completing the Form

The following explanation is numbered to correspond with items in the example on the actual form. The terms "tractor" and "implement" are used on the form. If combine costs are being estimated, the basic unit can be represented in the tractor spaces and the platform or corn-head in the implement spaces.

1. Describe the *job,* machine *size,* tractor *horsepower* and *fuel.* The example given is for a 21-foot tandem disc, and a 125-horsepower diesel tractor.

2. List the price—Use the prices quoted by your dealer; e.g., $47,500 tractor, $12,500 for disc.

3. Acres/hour—A formula for calculating the accomplishment rate (acres/hour) is width in feet x speed in mph x field efficiency x 8.25. Field efficiency for most tillage jobs is between 70 to 90 percent. Planters with several attachments may fall as low as 55 percent. Field size and shape as well as jobs that interfere with running time affect field efficiency.

4. Acres/year—Each acre covered twice is considered two acres. Yearly use can be estimated by listing the acres of each crop and fallow, multiplying by the number of machine uses for each crop and adding the results.

5. Hours/year—Include the hours the tractor is used for all purposes; e.g., crops and livestock. For the implement, divide acres/year by acres/hour. Seven hundred hours are estimated for the tractor in the example; 220 hours are calculated for the disc.

6. Ownership costs/hour—These are figured separately for the tractor and implement, since the rates and hours of use are different. *Table 1* is used for annual ownership factors.

7. Repair cost/hour—Different annual rates and hours of use necessitate separate calculations for the tractor and implement. Use *Table 2* to select the proper

repair rate. The average repair rates shown may be adjusted downward for the "early" life of a machine or upward for the years after half-life.

8. Fuel cost/hour—Average fuel consumption at average load (all jobs) is approximately 0.045 gallons per hour per rated horsepower for diesel tractors, or 0.062 for gas burning tractors, or 0.074 for L.P.G. Average fuel consumption can be estimated by multiplying the rated horsepower by one of these factors. The rates are noted at the bottom of the form.

9. Oil/hour—The current relationship of oil, grease and filters is about 10 percent of the gasoline or diesel fuel cost.

10. Labor cost—Use a rate for hired labor that is reasonable, even if the labor is your own. $5.50 is used for the example. This is multiplied by a factor of 1.2 to account for the service time needed other than that reflected by the "acres per hour" in *item 3* which is "field time."

11. Tractor, implement and labor cost/hour—This is your estimated cost by the hour for doing the job with your own equipment and hired labor or your own labor at a hired wage rate.

12. Tractor, implement and labor costs/acre—Total cost/hour converted into costs/acre.

13. Other costs/acre—(supplies, twine, seed, etc.) can be included when applicable.

14. Total cost/acre—This number can be used in various ways.

Comparisons That Can be Made and Other Uses of Cost Figures

By estimating the costs per acre for each of the operations involved in growing and harvesting a crop, and adding the sum of these to the cost of purchased items such as seed, fertilizer, herbicide, etc., a total cost per acre of production can be estimated in a crop enterprise budget.

Another use may be found by those who want to do custom work and need to establish a rate of charge. In the discing example, a custom rate of $3.60 per acre would cover all costs, but would not include profit for a full-time custom operator. On the other hand, if an operator is helping his neighbor, he may do the job for something less than $3.60 per acre, depending on how much of the ownership and labor costs are to be recovered.

Item 6 costs can be used as a basis for comparison with quoted rental or leasing rates. Caution should be used in this comparison, however. The contract will need to be examined to see who is responsible for insurance, taxes, and repairs and to determine the minimum or guaranteed use in the contract.

If custom rates are quoted on an hourly basis, *item 11* can be compared to the quoted rate. Remember, though, that labor comes with the custom operation and that your labor is included in *item 11*.

Item 14 can be compared to custom rates which are quoted on a per acre basis with the same cautions with respect to labor, as noted above.

Other Sources

Several machine programs are on the AGNET system in *MACHINEPAK*.

CUSTOM. This program calculates the acreage required for ownership costs to break-even with custom rates *OR* a custom rate to charge.

MACHINE calculates field machine costs, a custom rate, or a lease rate.

MACHINESIZE. This program matches machine size to tractor size.

FINANCE compares, on an after tax cost basis, the alternatives of a) buying with debt or equity capital, b) leasing on a long term contract, c) leasing on a short term, and d) custom hiring.

CROPBUDGET. This program combines all costs per acre for machine jobs, purchased inputs, labor, management, land, capital and overhead into a single budget.

ESTIMATING THE COST OF A MACHINE OPERATION (Example)

1. Operation: Tandem Disc - 21' - 125hp Diesel @ 5mph

	Tractor	Implement
2. List price:	$ 47,500	$ 12,500
3. Acres per hour : 21 ft. width x 5 mph x 80 % eff. ÷ 8.25		10 ac/hr.
4. Acres per year :		2,200 ac/yr.
5. Hours per year: (Item 4 ÷ Item 3 for implement only)	A. 700 hr/yr	B. 220 hrs/yr.
6. Ownership cost/hour: Tractor: $ 47,500 (Item 2) x .139 (Table 1) ÷ 700 (5A)		9.43
Implement: $ 12,500 (Item 2) x .152 (Table 1) ÷ 220 (5B)		8.64
7. Repair cost/hour: Tractor: $ 47,500 (Item 2) x .045 (Table 2) ÷ 700 (5A)		3.05
Implement: $ 12,500 (Item 2) x .042 (Table 2) ÷ 220 (5B)		2.39
8. Fuel cost/hour: .045 gal/hp hr. x 125 hp x $ 0.95 price/gal.		5.34
9. Oil/hour: $ 5.34 (Item 8) x .10		0.53
10. Labor cost for operation: $ 5.50 /hr. x 1.2		6.60
11. Tractor, implement and labor cost per hour: (sum Items 6-10)		$ 35.98
12. Tractor, implement and labor costs per acre: $ 35.98 (Item 11) ÷ 10 (Item 3 - acres/hour)		$ 3.60
13. Other costs per acre: (supplies, twine, etc.)		0.00
14. Total cost of operation per acre: (Item 12 + Item 13)		$ 3.60

Note: Average gal/hp/hour: Diesel .045; Gas .062; Propane .074

Table 1. Annual ownership costs as a decimal factor of list price.

Machine	Annual Rate
Tractor, loader, elevator, spike harrow	0.139
Combine, corn head, cultivar, hoe	0.150
Planter, drill, disc, go-dig	0.152
Hay and beet equipment, truck, rod	0.152
Square baler, forage chopper	0.154
Blower, grinder, mixer	0.154

Table 2. Annual repair costs as a decimal factor of list price.

Machine	Annual Rate
Harrow, packer, hoe, auger	0.01
Round baler, combine	0.03
NH_3 appl., drill, sq. baler & wagon	0.035
Truck, elevator, topper	0.035
Disc, sd. rake, sweep stake machine	0.042
Tractor, mower, windrower	0.045
Corn head, chopper, grinder	0.045
Plow, rod, thinner, digger	0.065
Planter, lister, roller mill	0.073
Chisel, go-dig, cultivator	0.085
Corn picker, feed wagon	0.085

ESTIMATING THE COST OF A MACHINE OPERATION

1. Operation: _____

	Tractor	Implement
2. List price:	$ _____	$ _____

3. Acres per hour : _____ ft. width x _____ mph x _____% eff. ÷ 8.25 _____ ac/hr.

4. Acres per year : _____ ac/yr.

5. Hours per year: (Item 4 ÷ Item 3 for implement only) A._____hr/yr B. _____ hrs/yr.

6. Ownership cost/hour:
   Tractor: $_____ (Item 2) x _____ (Table 1) ÷ _____ (5A) _____

   Implement: $_____ (Item 2) x _____ (Table 1) ÷ _____ (5B) _____

7. Repair cost/hour:
   Tractor: $_____ (Item 2) x _____ (Table 2) ÷ _____ (5A) _____

   Implement: $_____ (Item 2) x _____ (Table 2) ÷ _____ (5B) _____

8. Fuel cost/hour: _____gal/hp hr. x _____ hp x $_____ price/gal. _____

9. Oil/hour: $_____ (Item 8) x .10 _____

10. Labor cost for operation: $_____/hr. x 1.2 _____

11. Tractor, implement and labor cost per hour: (sum Items 6-10) $ _____

12. Tractor, implement and labor costs per acre: $_____ (Item 11)
    ÷ _____ (Item 3 - acres/hour) $ _____

13. Other costs per acre: (supplies, twine, etc.) _____

14. Total cost of operation per acre: (Item 12 + Item 13) $ _____

Note: Average gal/hp/hour: Diesel .045; Gas .062; Propane .074

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Table 2. Annual repair costs as a decimal factor of list price.

Machine	Annual Rate
Harrow, packer, hoe, auger	0.01
Round baler, combine	0.03
NH_3 appl., drill, sq. baler & wagon	0.035
Truck, elevator, topper	0.035
Disc, sd. rake, sweep stake machine	0.042
Tractor, mower, windrower	0.045
Corn head, chopper, grinder	0.045
Plow, rod, thinner, digger	0.065
Planter, lister, roller mill	0.073
Chisel, go-dig, cultivator	0.085
Corn picker, feed wagon	0.085

Metric Conversion Table

English	*Multiply by*	*Metric*
Foot (ft)	0.3	Meter (m)
Acre (A)	0.4	Hectare (ha)
Gallon (gal)	3.8	Liter (l)
Mile per hour (mph)	1.6	Kilometer per hour (kph)

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C-4, Budgeting

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