

# AGRICULTURAL EXPERIMENT STATION of The Alabama Polytechnic Institute, Auburn, Ala.

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## DETERMINING COSTS of TRACTOR and MACHINERY USE

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During the war, farmers faced the problem of producing more with less labor and with fewer new machines than in pre-war years. The present outlook for the immediate future indicates little improvement in either the labor or the new machinery situation.

To do the job now facing farmers and to get the work done properly, better use must be made of the labor, power, and machinery now on farms. This may require more custom work, the exchange use of machines, or more machinery rental. Such increased use probably will not materially reduce the useful life of machinery if it is properly lubricated, adjusted, and protected. In addition, such increased use probably will lower the operating costs of machinery per hour of use.

With the outlook for greater use of all types of farm machinery in the future, two groups of farmers in particular are greatly interested in determining in advance the approximate costs of tractor and machinery use. These are: (1) Farmers who now own or plan to purchase tractors and tractor equipment, but who are interested in the economy of use on their own farms, and in doing some custom work on neighbors' farms; and (2) farmers who do not now own and do not plan to purchase tractors and tractor equipment, but who are interested in the possibilities of renting such equipment or of hiring its use on their farms on a custom basis. Both groups are interested in the question: *When is a machine rental or custom rate reasonable?*

**Renting farm machinery.** The practice of renting farm machinery may involve several variations, including (1) renting a machine for cash, (2) renting a (harvesting) machine for a share of the crop, (3) exchanging the use of a machine for labor, or (4) exchanging the use of one machine for the use of another machine.

A fair rate of machinery rental on farms is dependent upon two things: First, the total cost of the service rendered by the machine; and second, the amount of use that can be expected from the machine during its lifetime.

**Custom work.** Custom work refers to the practice of furnishing a machine, its fuel and oil, and its operator to neighboring farmers on a piece rate or daily basis. To derive a "custom rate," wages for labor and the costs of materials furnished must be added to the machinery rental figure.

### DETERMINING MACHINERY COSTS

Included in the total costs of operating farm machinery are depreciation, interest, taxes, housing, insurance, repairs, and upkeep costs. Motor-powered machines, such as tractors, would also include the costs of fuel, oil, and lubricants.

**Depreciation** represents the original new cost of a machine less the estimated trade-in or junk value when the machine is to be disposed of.

**Interest** represents the average amount invested in the machine multiplied by the current rate charged for such loans. The average amount invested is the original new cost of the machine plus the estimated trade-in or junk value divided by two.

**Taxes and insurance** are actual cash expenses. **Housing** costs represent an estimate of the rental value of the housing space occupied by the machine.

**Repair and upkeep costs** represent the actual cash costs of new parts, repair parts, replacement items, and repair labor costs plus an estimate of the value of service labor performed on the machine.

\* Formerly Mimeograph Series.

**COST PER 10-HOUR DAY FOR TRACTORS**

To determine the operating costs per 10-hour day for tractors, it is necessary to know the original cost, the estimated years of useful life, the current rate of interest, and the amount of use per year.

the original new cost of a tractor is \$1,100, estimated useful life is 12 years, trade-in value is 10 per cent of the original cost (10 per cent times \$1,100 equals \$110), rate of interest is 5 per cent, and average annual use is 80 days or 800 hours. The following tabulations indicate how a fair rate of charge per day can be determined:

In the example below, it is assumed that

**EXAMPLE**

**A. RENTAL RATE** (where farmer who rents tractor furnishes the fuel, oil, and driver)

**ANNUAL COSTS:**

Depreciation . . . . .		\$ 82.50	
New cost (\$1,100) <u>minus</u> trade-in (\$110) <u>equals</u> total depreciation (\$990) <u>divided by</u> years of service (12) <u>equals</u> annual depreciation (\$82.50)			
Interest (5 per cent) . . . . .		30.25	
New cost (\$1,100) <u>plus</u> trade-in (\$110) <u>equals</u> \$1,210 <u>divided by</u> 2 <u>equals</u> average investment (\$605) <u>times</u> 5 per cent <u>equals</u> annual interest charge (\$30.25)			
Taxes (estimate) . . . . .		5.50	
Housing (estimate) . . . . .		2.75	
Insurance (estimate) . . . . .		11.00	
TOTAL OVERHEAD COSTS PER YEAR . . . . .		\$132.00	\$132.00
Repairs and new tires (estimate) . . . . .		\$ 75.00	
Service labor (estimate) . . . . .		25.00	
TOTAL CASH COST PER YEAR (excluding fuel) . . . . .		\$100.00	\$100.00
TOTAL ANNUAL COSTS (excluding fuel) . . . . .			\$232.00
RENTAL RATE PER 10-HOUR DAY . . . . .			\$ 2.90
Total annual cost (\$232) <u>divided by</u> number of days of annual use (80) <u>equals</u> rental rate per day (\$2.90)			

**B. RENTAL RATE** (where renter furnishes driver only)

**ANNUAL COSTS:**

Total overhead costs (See Section A) . . . . .		\$132.00	
Total cash costs (excluding fuel) . . . . .		100.00	
Fuel . . . . .		153.60	
16 gallons per day <u>times</u> cost per gallon (12 cents) <u>equals</u> fuel cost per day (\$1.92) <u>times</u> number of days of annual use (80) <u>equals</u> annual fuel costs (\$153.60)			
Grease, oil, and oil filters (estimate) . . . . .		30.00	
TOTAL ANNUAL COSTS . . . . .		\$415.60	\$415.60
RENTAL RATE PER 10-HOUR DAY . . . . .			\$ 5.20
Total annual costs (\$415.60) <u>divided by</u> number of days of annual use (80) <u>equals</u> rental rate per day (\$5.20)			

**C. CUSTOM RATE** (where tractor, fuel, oil, and driver are furnished)

Rental rate per 10-hour day (See Section B) . . . . .		\$ 5.20	
Labor rate (driver) per 10-hour day (estimate) . . . . .		4.00	
CUSTOM RATE PER 10-HOUR DAY . . . . .		\$ 9.20	

**COST PER ACRE FOR TRACTORS**

The same procedure can be used to determine tractor costs per acre. If it is

assumed that a normal 10-hour day's work with a tractor and two-bottom plow will cover 6 acres, the costs of the tractor would be as follows:

- A. Rental rate per acre for tractor, excluding fuel costs and driver  
(\$2.90 divided by 6 acres per day) . . . . . \$0.48
- B. Rental rate per acre for tractor, excluding driver  
(\$5.20 divided by 6 acres per day) . . . . . \$0.87
- C. Custom rate per acre for tractor  
(\$9.20 divided by 6 acres per day) . . . . . \$1.53

**COST PER 10-HOUR DAY FOR 2-BOTTOM PLOW**

When a plow, cultivator, combine, or any other tractor-drawn or tractor-powered machine is used, its costs can be figured

in the same way as for the tractor. For instance, if it is assumed that a two-bottom plow costing \$150 will last 15 years and will be used an average of 16 days annually, the costs would be as follows:

**EXAMPLE**

**RENTAL RATE**

**ANNUAL COSTS:**

Depreciation . . . . .	\$ 9.00	
New cost (\$150) <u>minus</u> trade-in (10 per cent of \$150 <u>equals</u> \$15) <u>equals</u> total depreciation (\$135) <u>divided by</u> years of service (15) <u>equals</u> annual depreciation (\$9)		
Interest (5 per cent) . . . . .	4.12	
New cost (\$150) <u>plus</u> trade-in (\$15) <u>equals</u> \$165 <u>divided by</u> 2 <u>equals</u> average investment (\$82.50) <u>times</u> 5 per cent <u>equals</u> annual interest charge (\$4.12)		
Taxes, housing, insurance (estimate) . . . . .	1.50	
Repair and upkeep costs (estimate) . . . . .	15.00	
TOTAL ANNUAL COSTS . . . . .	\$29.62	\$29.62
RENTAL RATE PER 10-HOUR DAY . . . . .		\$ 1.85
Total annual cost (\$29.62) <u>divided by</u> number of days of annual use (16) <u>equals</u> rental rate per day (\$1.85)		

By assuming a rate of 6 acres covered per 10-hour day, the above rental per day

can be converted into a cost rate per acre, as follows:

- Custom rate per acre  
(\$1.85 divided by 6 acres per day) . . . . . \$0.31

**TOTAL COSTS OF FIELD OPERATIONS**

To determine the costs of performing any field operation, three cost items are needed: the cost of the power, the machine,

and the necessary labor to run the outfit. In the previous example given, costs of breaking land can easily be figured either on a daily basis, an hourly basis, or an acreage basis, as shown on page 4.

**ESTIMATED COST PER DAY, PER HOUR, AND PER ACRE FOR BREAKING  
LAND WITH TRACTOR POWER AND A 2-BOTTOM PLOW**

ITEM	COST PER DAY	COST PER HOUR	COST PER ACRE
Tractor costs	\$5.20	\$0.52	\$0.87
Machinery costs	1.85	.18	.31
Labor costs	4.00	.40	.67
<b>Total</b>	<b>\$11.05</b>	<b>\$1.02</b>	<b>\$1.85</b>

**WHEN IS A MACHINE RENTAL OR CUSTOM RATE REASONABLE?**

A fair rental charge or custom rate for a machine will vary with the conditions under which it is operated. If the machine is operated by its owner or someone hired by him, the risks of damage need be no greater than when used on his own farm. If, however, the machine is turned over to the person hiring it to use as he sees fit, the owner may be justified in adding a margin above actual use costs to cover additional risks. Unusual or severe operating conditions may affect the rate charged. If the machine is hired for a short time only, the rate may be higher than if it is hired for a longer period. Usually the person hiring a machine should bear the costs of transportation.

Perhaps the most satisfactory way to determine reasonable rates is for a group of farmers to cooperate in a record-keeping project, and thus find what are reasonable standards of performance.<sup>1</sup>

Rates for a particular operation may show variation in different communities, or may fluctuate within a community for a particular year. Topography, size of fields, texture of soil, frequency of gullies, ditches, stumps and rocks, all of which may decrease the rate of daily performance or may damage machines, should be taken into account in arriving at fair and reasonable rates.

<sup>1</sup>For a detailed summary of costs and performance rates of tractors and tractor equipment, see Alabama Agricultural Experiment Station Bulletin No. 260, "Farm Power and Equipment Costs in Northern Alabama."