1976 CROP PRODUCTION SCHOOL

CALCULATING MACHINE COSTS

FOR WHEAT PRODUCTION

(A CASE FARM APPROACH)

by

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A. The first part of the problem is to estimate the machinery costs per acre for wheat production on the case farm.

1. Some relevant information about the machines used in wheat production is given in table 2. Complete table 2 by calculating the expected salvage value at the end of a 10 year life for each of the machines, see table 1.

2. Calculate the fixed and variable costs per hour of operation for each machine by completing table 7. Use the procedures presented to make these computations.

3. Complete table 8 to estimate the direct labor per acre, fuel, lube and repair costs per acre and fixed costs per acre.

Procedures And Formulas To Compute Annual Machinery And Building Costs

A. Fixed or Ownership Costs

1. $\text{Depreciation/Year} = \frac{\text{Purchase Price} - \text{Investment Credit}^{1/} - \text{Salvage Value}}{\text{Estimated Years of Life}}$

estimates of salvage value are presented in table 1

2. $\text{Interest/Year} = \frac{\text{Purchase Price} + \text{Salvage Value}}{2} \times \text{Interest Rate}$

3. $\text{Insurance/Year} = \frac{\text{Purchase Price} + \text{Salvage Value}}{2} \times \text{Insurance Rate}$

4. Housing/Year = Average Investment x (.5% to 3.5%)

there are no personal property taxes to consider in Minnesota

B. Variable or Operating Costs

1. Fuel Cost/Hour = Maximum P.T.O. HP x Fuel Per HP-Hr. x Price Fuel/Gallon

estimates of fuel consumption per hp-hr. are given in table 6

2. Lubrication Cost/Hour = Gallons Consumed Per Hour x Price Per Gallon

or = 15% of Fuel Cost

use estimates of lube consumption per hour given in table 6

3. Repairs and Maintenance

Repair Costs/Hour = Purchase Price x Total Repair Cost as a Percent of New Cost ÷ Hours of Wearout Life x Hours of Annual Use

use estimates of repair costs as a percent of new cost that are given in tables 4 & 5

4. Labor (Direct Only)

Labor Cost/Year = Hours of Machine Time x Wage Rate

1/ Use amount of investment credit taken

C. Calculating the Acres Covered per Hour and Allocating Machinery Fixed and Variable Costs per Acre

1. Acres per hour indicates how many acres a machine can be expected to cover in one hour of operation under normal conditions. This will vary with machine width, ground speed and field efficiency.

$$\text{Acres per Hour} = \frac{S \times W \times E}{8.25}$$

Where: S = Speed of the machine while it is in motion in miles per hour
W = Width of the machine in feet
E = Field efficiency of the machine expressed as a decimal

values for speed, width and field efficiency are given in table 7

2. The hours required to cover one acre can be computed as the reciprocal of acres per hour.

$$\text{Hours per Acre} = \frac{1}{\text{Acres per Hour}}$$

3. Fixed and variable machine costs can be allocated to an individual acre by multiplying the appropriate cost estimates per hour by the hours required to perform the operation on one acre.

Cost per Acre = Cost per Hour x Hours per Acre

D. An Example

Calculate the cost per hour of plowing with a 100 drawbar hp (117.4 P. T. O. HP) tractor and 6-16" plow. Also calculate the cost of plowing per acre.

Purchase cost of tractor, $19,000
Purchase cost of plow, $4,650
Years of useful life for both the tractor and plow, 10 years
Hours of use per year for the tractor, 200
Hours of use per year for the plow, 80
Interest rate, 9%
Price of diesel fuel is $.40 per gallon
Price of crankcase oil is $3 per gallon
Speed of plowing, 4.5 mph
Field efficiency, 80%

1. Fixed or Ownership Costs

   a. Depreciation

   Using entries in table 1:

   Tractor Salvage Value = $19,000 x .337 = $6,403

   Plow Salvage Value = $4,650 x .227 = $1,056

   $$\text{Tractor Depreciation/Yr.} = \frac{19,000 - 1,330 - 6,403}{10} = \$1,126.70$$

   $$\text{Plow Depreciation/Yr.} = \frac{4,650 - 326 - 1,056}{10} = \$326.80$$

   b. Interest

   $$\text{Interest on Avg. Tractor Investment} = \frac{19,000 + 6,403}{2} \times .09 = 1,143.14$$

   $$\text{Interest on Avg. Plow Investment} = \frac{4,650 + 1,056}{2} \times .09 = 256.77$$

   c. Insurance and Housing

   $$\text{Annual Insurance \& Housing on Tractor} = \frac{19,000 + 6,403}{2} \times .01 = 127.01$$

   $$\text{Annual Insurance \& Housing on Plow} = \frac{4,650 + 1,056}{2} \times .01 = 28.53$$

   d. Total Annual Fixed Cost and Fixed Cost per Hour

   The annual depreciation, interest, insurance and housing costs can be summed for each machine to obtain total annual fixed costs. Dividing by the number of hours of use per year results in fixed cost per hour of operation.

		Annual Fixed Costs				Fixed Costs/Hour			
Item	Hr/Yr	Depr.	Int.	Ins. & Housing	Total	Depr.	Int.	Ins. & Housing	Total
Tractor	200	$1,126.70	$1,143.14	$127.01	$2,396.85	$5.634	$5.716	$.635	$11.984
Plow	80	326.80	256.77	28.53	612.10	4.085	3.210	.357	7.651

2. Variable or Operating Costs

   a. Use the fuel consumption for a diesel tractor under heavy load

      Fuel Cost per Hour = 117.4 hp x .053 x $.40 = $2.489

   b. Lubrication Cost per Hour = .021 x $3 = .063

   c. Repairs and Maintenance

      Tractor Repairs/Hour = $19,000 x .00010 = 1.900

      Plow Repairs/Hour = $4,650 x .000533 = 2.480

   d. Labor

      Labor Cost /Hour = 3.00

   e. Summary of Variable Costs per Hour

Item	Fuel	Lube	Repairs	Labor	Total
Tractor	2.489	.063	1.900	3.00	7.452
Plow	--	--	2.480	--	2.480

3. Summary of Fixed and Variable Costs per Hour for Plowing

   Cost per Hour = Fixed Cost of the Tractor and Plow + Variable Cost of the Tractor and Plow

   = 11.984 + 7.651 + 7.452 + 2.48 = $29.567

4. Acres per Hour and Hours Required per Acre

   $$\text{Acres per Hour} = \frac{4.5 \text{ mph} \times 8.0 \text{ ft.} \times .80}{8.25} = \frac{28.8}{8.25} = 3.49$$

   $$\text{Hours per Acre} = \frac{1}{3.49} = .29$$

5. Fixed and Variable Costs per Acre Plowed

	Cost Per Hour			Cost Per Acre		
Item	Fixed	Variable	Hr/Acre	Fixed	Variable	Total
Tractor	11.984	7.452	.29	3.475	2.161	5.636
Plow	7.651	2.480	.29	2.219	.719	2.938
Total	19.635	9.932		5.694	2.880	8.574

Table 1. Salvage Value Expressed As A Percent Of Initial List Price, For Various Categories Of Farm Equipment At Selected Years Of Age

	Equipment Categories			
	I	II	III	IV
Age Of Equipment (Year)	Wheel Tractors Stationary Power Units	Combines S.P. Windrowers Tillage Equipment Spray Equipment Fertilizer Equipment	Forage Harvesters Balers Blowers	Hay Conditioners Mowers Seeding Equipment Corn Heads
1	100.0	100.0	100.0	100.0
2	63.0	58.6	52.2	55.3
3	58.8	52.7	46.4	49.5
4	54.8	47.5	41.2	44.3
5	51.1	42.7	36.7	39.6
6	47.7	38.4	32.6	35.5
7	44.5	34.6	29.0	31.8
8	41.5	31.1	25.7	28.4
9	38.8	28.0	22.9	25.4
10	36.2	25.2	20.3	22.8
11	33.7	22.7	18.1	20.4
12	31.5	20.4	16.1	18.2
13	29.4	18.4	14.3	16.3
14	27.4	16.6	12.7	14.6
15	25.6	14.9	11.3	13.1

Source: Derived from American Society of Agricultural Engineers, 1970, Agricultural Engineers Yearbook, p. 283.

Table 2. Information About Machines Used In Wheat Production

Machine	Size	Speed	Field Eff.	Annual Hours Use	List Price	Salvage Value[a/]
100 HP Tractor	117.4 P.T.O. HP	-	-	200	$19,000	$
60 HP Tractor	67 P.T.O. HP	-	-	300	10,520	3,545
6-16" Plow	8'	4.5	.80	80	4,650	
Fertilizer Spreader	20'	5.5	.80	50	1,200	272
Disc	17'	5.5	.80	100	1,950	443
Sprayer	50'	6.5	.60	80	2,500	568
Harrow	48'	6.5	.80	50	1,800	409
Grain Drill	14'	4.5	.70	50	3,640	743
Truck	2 ton	-	-	200	12,000	4,000
Combine & Grain Head (Diesel)	18'	4.0	.65	100	28,500	
Grain Wagon	150 bu.	-	-	200	2,000	200

a/ Calculate salvage value assuming the machine has a useful life of ten years in each case.

Table 3. Estimated Length Of Life, Total Life-Time Repair Costs As A Percent Of List Price And Identification Of Repair Cost Categories For Selected Machines

Machine	Estimated Wearout Life, Hrs.	Total Life-Time Repair Cost As % Of New Cost	Repair Cost Category (see table 4 + 5)
Baler, P.T.O.	2,250	80	A
Baler, with engine	2,250	60	D
Blower, ensilage	2,250	80	A
Combine, P.T.O.	2,250	100	B
Combine, S.P.	2,250	60	D
Corn head	2,250	100	B
Corn picker	2,250	80	A
Cutter, rotary & stalk	2,250	60	D
Fertilizer equipment	1,200	120	E
Floats & scraper	2,250	60	D
Harvester, flail	2,250	80	A
Harvester, florage, pull-type	2,250	80	A
Harvester, forage, S.P.	2,250	60	D
Harvester, potato	2,250	80	A
Hay conditioner	2,250	100	B
Landplane	2,250	60	D
Loader, ensilage	2,250	100	B
Loader, front end	2,250	60	D
Manure spreader	2,250	60	D
Mower	2,250	120	C
Mower/conditioner/windrower	2,250	120	C
Rake, side delivery	2,250	100	B
Seeding equipment	1,200	100	F
Sprayer, mounted	1,200	100	F
Sprayer, self-propelled	2,250	80	A
Stationary power unit	12,000	120	b/
Tillage tools a/	2,250	120	C
Tractor, 2-wheel drive	12,000	120	b/
Truck, farm	2,250	60	A
Truck, feed	2,250	60	D
Truck, pickup	2,250	60	D
Wagon and box	5,000	100	b/
Wagon, feed	2,250	100	B
Windrower, self-propelled	2,250	100	B
Tractor, 4-wheel drive	12,000	100	B

Source: Adapted from American Society of Agricultural Engineers, 1970 Agricultural Engineering Yearbook, p. 282

a/ Includes plows, discs, harrows, cultivators, etc.

b/ Identified by name in table 4.

Table 4. Repair Costs For Each Hour Of Use Per $1.00 New Cost For Wheel Tractors And Wagons With Boxes At Selected Accumulative Hours Of Machine Use

Accumulated hours of machine use	Wheel tractors	Wagons with boxes
1 - 250	.000014	.000061
251 - 500	.000026	.000099
501 - 1,000	.000037	.000131
1,001 - 1,500	.000048	.000161
1,501 - 2,000	.000057	.000184
2,001 - 2,500	.000065	.000204
2,501 - 3,000	.000072	.000221
3,001 - 4,000	.000081	.000243
4,001 - 5,000	.000092	.000266
5,001 - 6,000	.000102	*
6,001 - 7,000	.000112	*
7,001 - 8,000	.000119	*
9,001 - 10,000	.000133	*
10,001 - 11,000	.000140	*
11,001 - 12,000	.000147	*
Average for life	.000100	.000200

* Beyond expected life.

Table 5. Repair Costs For Each Hour Of Use Per $1.00 New Cost For Various Machinery Categories At Selected Accumulative Hours Of Machine Use

	Machine Category[a]					
	A	B	C	D	E	F
Accumulated hours of machine use	P. T. O. baler, forage harvester corn picker	Corn heads hay conditioner S.P. windrower	Mower, mower conditioner/ windrower, tillage tools	S.P. combine manure spreader	Fertilizer equipment	Seeding equipment
1 - 50	.000078	.000097	.000170	.000059	.000282	.000234
51 - 100	.000127	.000159	.000248	.000096	.000462	.000384
101 - 150	.000157	.000196	.000290	.000118	.000568	.000473
151 - 200	.000179	.000224	.000322	.000136	.000650	.000541
201 - 400	.000221	.000279	.000376	.000168	.000803	.000669
401 - 600	.000272	.000341	.000440	.000206	.000988	.000823
601 - 800	.000312	.000390	.000487	.000236	.001130	.000942
801 - 1,000	.000345	.000432	.000525	.000261	.001250	.001040
1,001 - 1,200	.000374	.000468	.000558	.000283	.001360	.001130
1,201 - 1,400	.000400	.000501	.000587	.000303	*	*
1,401 - 1,600	.000423	.000530	.000612	.000320	*	
1,601 - 1,800	.000445	.000557	.000636	.000337	*	*
1,801 - 2,000	.000465	.000582	.000658	.000352	*	*
2,001 - 2,250	.000487	.000610	.000680	.000368	*	*
Avg. for life	.000356	.000444	.000533	.000267	.001000	.000833

* Beyond expected life.

a/ A complete listing of the machine items appearing in the various repair categories appears in table 3.

Table 6. Estimating Fuel And Crankcase Oil Consumption Per Hour Of Operation

1. Average fuel consumption for a specific make and model tractor can be approximated from the Nebraska Tractor Test Data, available from the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.

2. Average fuel consumption can also be estimated by the following formula:

   Average gasoline consumption gallon per hour = 0.06 x maximum P.T.O. HP.
   A diesel tractor will use approximately 73 percent as much fuel in gallons as a gasoline tractor, and LP gas tractors will use approximately 120 percent as much.

3. The figures in 2 above can be increased by 20 percent for heavy loads and reduced 20 percent for light loads. With this consideration, fuel consumption per hp-hour by fuel and type of load is given below.

	Size Load		
Type Fuel	Heavy	Average	Light
Diesel	.053	.044	.035
Gasoline	.072	.060	.048
LP Gas	.086	.072	.058

4. The gallons of crankcase oil required can be estimated using the following consumption for specified sizes of tractors.

Tractor DBHP	Oil Cons./Hr.
17 - 24	.001
25 - 34	.001
35 - 49	.012
50 - 64	.013
65 - 89	.017
90+	.021

Table 7. Costs Per Hour Of Operation For Machines Used In Wheat Production

Machine	Annual Fixed Costs				Fixed Cost Per Hour	Variable Costs Per Hour					Total Costs/Hr.
	Depr.	Interest	Ins. & Housing	Total		Fuel	Labor	Lube	Repairs	Total	
100 HP Tractor	1259.70	1143.14	127.01	2429.85	12.649						
60 HP Tractor	623.86	632.92	70.32	1327.10	4.424	1.420 c/	3.00	.039	1.052	5.511	9.935
6 - 16" Plow						xx	xx	xx			
Fertilizer Spreader	84.44	66.24	7.36	158.00	3.160	xx	xx	xx	1.200	1.200	4.360
Disc	137.05	107.68	11.96	256.69	2.567	xx	xx	xx	1.040	1.040	3.607
Sprayer	175.70	138.06	15.34	329.10	10.970	xx	xx	xx	2.083	2.083	13.053
Harrow	126.50	99.40	11.04	236.94	4.739	xx	xx	xx	.960	.960	5.699
Grain Drill	264.22	197.24	21.92	483.38	9.668	xx	xx	xx	3.032	3.032	12.700
Truck	716.00	720.00	220.00 b/	1656.00	8.280	3.600 c/	3.00	.070 a/	1.200	7.870	16.150
Combine & Grain Head											
Grain Wagon	166.00	99.00	11.00	276.00	1.380	xx	xx	xx	.889	.889	2.269

a/ Assume the combine requires .025 gallons of oil per hour of operation
b/ Includes license and insurance
c/ Make calculations assuming diesel engines operating under heavy load

Table 8. Calculating Machine Costs Per Acre

Month	Operation	Tractor	A/Hr.	Hrs./A	Total Cost/Hour			Total Cost/Acre		
					Tractor[a]	Implement	Total	Tractor	Implement	Total
_____	Hauling w/truck	xx	xx	.13	xx	16.150	16.150	xx	_____	2.10
_____	Disc	100 HP	9.07	.11	19.436	3.607	23.043	_____	_____	2.53
_____	Fertilizer	60 HP	10.67	.09	9.935	4.360	14.295	_____	_____	1.29
_____	Spray	60 HP	23.64	.04	9.935	13.053	22.988	_____	_____	.92
_____	Disc	100 HP	9.07	.11	19.436	3.607	23.043	_____	_____	2.53
_____	Harrow	100 HP	30.25	.03	19.436	5.699	25.129	_____	_____	.75
_____	Plant	60 HP	5.35	.19	9.935	12.700	22.635	_____	_____	4.30
_____	Combine		_____	___	xx	_____	_____	xx	_____	_____
_____	Haul w/grain wagon	60 HP	xx	.32	9.935	2.269	12.204	_____	_____	3.91
_____	Plow	100 HP	_____	___	_____	_____	_____	_____	_____	_____
Hours Direct Labor Per Acre[b]				_____						
Fixed Cost Per Acre (Depreciating Interest, Ins. & Housing)							_____			
Fuel Lube and Repairs Per Acre										_____

a/ Includes labor cost
b/ The hours of direct labor per acre are equal to the sum of the hours per acre for each operation.

Table 9. Machinery Performance Data

Machine	Speed or Performance Rate	Typical Range for Field Efficiency %
Tillage		
Moldboard or disk plow	3.5 - 6 mph	70 - 90
Chisel plow	4.6 - 5 mph	70 - 90
Lister	3.5 - 5 mph	70 - 90
One-way disk, 3.5 inch depth	4 - 7 mph	70 - 90
Subsoiler	3 - 5 mph	70 - 90
Land plane	--	--
Powered rotary tiller, 3-4 inch increment of cut	1 - 5 mph	70 - 90
Harrow		
Single disk	3 - 6 mph	70 - 90
Tandem disk	3 - 6 mph	70 - 90
Offset or heavy tandem disk	3 - 6 mph	70 - 90
Spring tooth	3 - 6 mph	70 - 90
Spike tooth	3 - 6 mph	70 - 90
Roller or packer (cultipacker)	4.5 - 7.5 mph	70 - 90
Rotary hoe	5 - 10 mph	70 - 85
Rod weeder	4 - 6 mph	70 - 90
Field cultivator	3 - 8 mph	70 - 90
Row crop cultivator		
Shallow	2.5 - 5 mph	70 - 90
Deep	1.5 - 3 mph	70 - 90
Bed sled or shaper	2 - 4 mph	70 - 90
Unpowered rotary cultivator	3 - 7 mph	70 - 90
Fertilizer and chemical application		
Fertilizer spreader, pull-type	3 - 5 mph	60 - 75
Anhydrous ammonia applicator	3 - 5 mph	60 - 75
Sprayer	3 - 5 mph	50 - 80
Planting		
Corn, soybeans or cotton drilling seed only	3 - 6 mph	50 - 85
Corn, soybeans or cotton drilling all attach.	3 - 6 mph	50 - 85
Grain drill	2.5 - 6 mph	65 - 85
Harvesting, mower only	5 - 7 mph	75 - 85
Mower-conditioner, cutterbar-type	4 - 6 mph	60 - 85
Mower-conditioner, flail type	4 - 6 mph	60 - 85
Self-propelled mower-conditioner-windrower	3 - 6 mph	55 - 85
Conditioner only	5 - 7 mph	75 - 85
Rake	4 - 5 mph	70 - 85

Table 9 - continued

Machine	Speed or Performance Rate	Typical Range For Field Efficiency %
Baler	3 - 10 tons/hr.	60 - 85
Hay cuber	3 - 5 tons/hr.	60 - 85
Loose hay sweep	7 - 24 tons/hr.	--
Hay stacker, separate bucking operation	24 - 33 tons/hr.	--
Bale loader-stacker, loading only	9 - 15 tons/hr.	--
Flail-type forage harvester, green forage	5 - 10 tons/hr.	50 - 75
Forage harvester, flywheel or cylinder kinfe	Performance rate is	
Green forage	generally a direct	
Wilted forage	function of the PTO	
Dry hay or straw	hp available from the	
Corn silage	power source. Usual	
Recutter attachment	travel speeds are 1.5 - 4 mph	
Windrower, small grain	5 - 7 mph	75 - 85
Combine		
Small grain	2 - 4 mph	65 - 80
Corn	2 - 4 mph	65 - 80
Corn picker		
1 row trailed	2 - 4 mph	60 - 80
2 row trailed	2 - 4 mph	60 - 80
2 row mounted	2 - 4 mph	60 - 80
Cotton picker, 1 row, mounted	0.6 - 0.8 acres/hr.	60 - 75
Cotton picker, 2 row, self-propelled	0.9 - 1.2 acres/hr.	60 - 75
Cotton stripper, 2 row	1 - 2 acres/hr.	60 - 75
Beet topper	2 - 3 mph	60 - 80
Beet harvester	3 - 5 mph	60 - 80
Rotary mower, horizontal blade		
Open field	3 - 8 mph	75 - 85
Row crop	3 - 6 mph	75 - 85
Forage blower, wilted forage	20 - 30 tons/hr.	--
Corn or grass silage	20 - 50 tons/hr.	--

E. Computing Building Costs

1. Procedures to Estimate Annual Building Costs

a. Depreciation per Year = $\frac{\text{New Cost - Salvage Value}}{\text{Years of Useful Life}}$

The salvage value is normally considered zero for buildings. If they have any value at the end of their useful life it is usually assumed this remaining value will not exceed the cost of removing the building.

b. Interest per Year = $\frac{\text{New Cost + Salvage Value}}{2}$ x Interest Rate

c. Repairs and Maintenance per Year = New Cost x Rate per Year

We usually use 1.0 to 2.0 percent as the rate per year

d. Personal Property Taxes per Year = Assessed Value x Tax Rate

or New Cost x .01

e. Insurance per Year = $\frac{\text{New Cost + Salvage Value}}{2}$ x Insurance Rate

The insurance rate is usually about $6 per $1,000 of value, making the rate for the formula .006. If the salvage value is zero, this is the same as .003 of new cost.

2. These costs can be allocated to one unit of an enterprise (Acre, head, etc.) based on the proportion of the annual total building service used by that unit.

3. An Example: Compute Building Costs for Feeder Pigs

Purchase Price of the Building	$13,000
Salvage Value	0
Length of Life	12 years
Interest Rate	9 percent

The cost can be calculated using the above formulas. Since the salvage value is zero, it is faster to calculate the percent of new cost each annual cost represents.

For this example:

Cost Item	% of Purchase Price
Depreciation	8.5
Interest	4.5
Repairs and Maintenance	1.5
Taxes	0.7
Insurance	0.3
Total	15.5

Then: Building Cost per Year = $13,000 x .155 = $2,015.

If the building holds 480 head per batch, then building costs are $2,015 ÷ 480 = $41.98 per pig space. Allocating these costs per pig depends on the number of batches fed per year.

Number of Batches	Building Cost Per Pig
1	$41.98
2	20.99
3	13.99

4. Another Example: Compute Building Costs for Machinery Storage

Purchase Cost of 46' x 72' Building	$4,650
Salvage Value	0
Years Life	10
Interest Rate	9%

Cost Item	% of Purchase Price
Depreciation	10.0
Interest	4.5
Repairs and Maintenance	1.5
Taxes	0.7
Insurance	0.3
Total	17.0

Building Costs per Year = $4,650 x .170 = $790.50

These costs can be allocated to individual machines based on their value or the square footage they occupy.

Basing it on the square footage of space used, the annual building cost per square foot for this example is: $\frac{\text{Annual Building Cost}}{\text{Sq. Ft. in Building}} = \frac{790.50}{46 \times 72} = \frac{790.50}{3,312} = \$.239$

The annual building cost for an individual machine can be computed by multiplying the cost per sq. ft. by the square footage occupied by the machine.

If a 100 hp tractor stored in the above building required 127 sq. ft., then
127 x .239 = $30.35 annual housing cost for that tractor.

If a 60 hp tractor stored in the above building requires 104 sq. ft., then
104 x 239 = $24.86 annual housing cost for that tractor.

This procedure of estimating annual housing costs for machinery can be used in place of the standard percentage described in Section A.

B. Calculating Breakeven Costs

You have calculated the costs above of owning and operating your own combine to harvest wheat. Calculate the breakeven acreage between owning and hiring a custom operator to harvest your wheat for $15.00 per acre. Write out the equation and make your computations under each of the following assumptions.

1. Assume your labor has no opportunity cost and field losses are identical under both methods.

2. Assume your labor has an opportunity cost of $3.00 per hour and field losses are identical under both methods.

3. Assume your labor has an opportunity cost of $3.00 per hour and field losses are (2 bu.) $7.00 per acre greater with the custom operator.

MACHINERY AND EQUIPMENT COST WORKSHEET *

Basic Information

1. Machine (kind) _____
2. New cost of machine = _____
3. Annual hours use = _____
4. Speed of machine while in operation = _____
5. Field efficiency of machine (decimal less than 1) = _____
6. Width of machine (working width in feet) = _____
7. Acres per hour = (_____ (speed) times _____ (width) times _____ (field efficiency)) ÷ 8.25 = _____

Annual Ownership Costs (Fixed)

8. Depreciation = (_____ (new cost - invest. credit) - _____ (salvage value)) ÷ _____ (years used) = _____
9. Interest on investment = (_____ (new cost) plus _____ (salvage value)) ÷ 2 x (__%) interest = _____
10. Insurance and housing = _____ (new cost) times _____ (1 to 2)% = _____
11. Total ownership cost of machine for year (8 + 9 + 10) = _____
12. Average ownership cost per hour (11 ÷ 3) = _____
13. Average ownership cost per acre (12 ÷ 7) = _____

Hourly Operating Costs (Variable)

14. Fuel cost per hour _____ (gal. fuel per hour) times _____ (price fuel (gallon)) = _____
15. Oil cost per hour _____ (gal. oil per hour (.01 - .025)) times _____ (price oil (gallon)) = _____
16. Repairs and maintenance per hour _____ (new cost) times _____ (repair + maint. factor) = _____

Repairs + maint. factors: tractor = .00012, plow = .0007, disk = .00065, combine = .00027

17. Total hourly operating costs (14 + 15 + 16) = _____
18. Total annual operating costs = (17 x 3) = _____
19. Total operating costs per acre (17 ÷ 7) = _____
20. Total ownership and operating costs per hour (12 + 17) = _____
21. Total ownership and operating costs per acre (13 + 19) = _____
22. Total ownership and operating costs annually (11 + 18) = _____

Total Function Costs Per Hour and Acre

23. Labor cost per hour = _____
24. Labor cost per acre (23 ÷ 7) = _____
25. Tractor cost per hour = _____
26. Tractor cost per acre (25 ÷ 7) = _____
27. Total cost per hour (labor, machine, tractor) (20 + 23 + 25) = _____
28. Total cost per acre (labor, machine, tractor) (21 + 24 + 26) = _____

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