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FARM MACHINERY ECONOMIC COST ESTIMATES FOR LATE 2005

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The tables in this publication contain estimates of farm machinery operation costs for the second half of 2005. The estimates use an economic engineering approach. The data are intended to show a representative farming industry cost for specified machines and operations.

Machine costs are separated into time-related and use-related categories. Use-related costs are incurred only when a machine is used. They include fuel, lubrication, use-related repairs and labor. Time-related costs, also often referred to as overhead costs, accrue to the owner whether or not a machine is used. Overhead includes time-related economic costs: interest, insurance, personal property taxes, and housing. There are no personal property taxes in Minnesota. Depreciation is both a use- and a time-related cost. Depreciation will be related to use to the extent that increased annual usage shortens years of life and/or reduces salvage value. While not entirely use-related, depreciation is included along with operating expenses and labor costs in the columns labelled "use-related cost/acre".

OVERHEAD COSTS: Time-related costs are prorated over a 12 year economic life except where otherwise indicated. Trade-in values are estimated based on American Society of Agricultural Engineers formulas. Purchase prices are discounted from manufacturers' list prices. A ten percent discount off list price appears "normal." Income tax implications are ignored. A housing charge of 33 cents per square foot of shelter space needed per year is made.

A six percent “real” (inflation-adjusted) interest rate is used in the cost estimates. This real rate is calculated by taking a nominal rate charged by lenders, minus a measure of the inflation rate per year expected over the years of ownership. Insurance is charged at 0.85 percent of the undepreciated value. The interest and insurance cost formulas are slightly different from those used in previous years. Adding one year's depreciation to the numerator in effect bases the costs on the value at the beginning of each year owned. This gives a slightly more accurate calculation of the actual costs over the years owned. In states where farm machinery is taxed as personal property, property tax could be calculated in a similar manner, depending on how taxes are assessed.

Formulas used to compute machinery overhead costs:

$$\text{Depreciation, \$/year} = \frac{\text{purchase cost - salvage value}}{\text{years you will use machine}}$$

$$\text{Interest, \$/year} = \frac{\text{purchase cost + salvage value + depreciation (\$/year)}}{2} \times \text{“real” interest rate}$$

$$\text{Insurance, \$/year} = \frac{\text{purchase cost + salvage value + depreciation (\$/year)}}{2} \times \text{insurance rate}$$

Housing, $/year = price per sq. foot x sq. feet shelter space required

Taxes per year = 0 (no taxes on personal property in Minnesota)

OPERATING COSTS: Fuel cost is calculated by multiplying the fuel consumption by the price of fuel, with fuel consumption assumed to be 0.044 gallons of diesel fuel per PTO horsepower-hour on average for each implement type. Fuel consumption per acre is averaged across sizes within a given implement type. The price of farm diesel fuel is projected at $2.20 per gallon. All power units, tractors, combines, trucks, etc., use diesel fuel. Lubrication cost is assumed to be 15 percent of fuel cost.

The formulas for repair and maintenance costs estimate total accumulated repair costs based on accumulated hours of lifetime use. Repair and maintenance calculations are based on American Society of Agricultural Engineers formulas. The total cost is then divided by accumulated hours to arrive at an average per hour cost estimate. The amount of annual use of a machine is an estimate of the number of hours a commercial farmer would use that particular machine in one year.

Labor is charged at an hourly wage rate, which includes 30 percent benefits. Charge rates are $11.00 per hour for unskilled labor and $13.50 per hour for skilled labor. The skilled labor rate is generally used with the planting and harvesting equipment and sprayers. Labor per acre for an operation such as plowing or disking is calculated by using the work rate on the implement. Less labor per acre is used in a disking operation that covers more acres per hour than in a plowing operation. A small amount of extra labor is added over and above machine time to allow for downtime for tasks such as making adjustments and filling sprayers and planters. The labor adjustment ranges from 2 percent additional time for tillage to 33 percent for spraying.

These estimates will not represent any given individual's cost. Differences in buying power, repair programs, average annual use, and overall replacement programs should be considered when making adjustments. It may be useful to record actual expenses for at least a few of your implements and compare your costs to these estimates. These estimates will differ from records because they are estimates, but also because they are averaged over the use period and are expressed in today's dollars. If these estimates are compared to recorded costs that include repairs or depreciation based on historical costs, one adjustment that would be required for comparability would be to index the historical cost to current prices.

THE COST IMPACT OF ANNUAL USAGE AND TRADE-IN AGE: The adoption of modern equipment such as combines in recent decades has reduced the need for farmers to cooperate with their neighbors in activities such as "threshing bees" and "barn raisings" that were common earlier. As equipment gets larger and more expensive, the practices of using custom operators, purchasing equipment jointly, and trading work may return as more producers are priced out of the market for individual ownership. Record summaries from the Southeastern Minnesota Farm Business Management Association seem to confirm this trend as they show an increase in custom operator use, at least in the case of corn silage on owned land. Custom hiring expenses for corn silage averaged 3 percent of total machinery-related expenses in 1985 and 8 percent in 1990. Custom hiring expenses as a share of total machinery expenses for that crop had grown to 25 percent in 1999 and 19 percent in 2000.

The table below shows how covering more acreage with a piece of equipment can help control costs. The other variable that enters into the cost calculations is how long the machine will be used before being traded in. Trade-in decisions probably depend on the degree of wear and tear placed on the machine, in case using it over more acres each year probably means trading it sooner than otherwise.

One machine that some producers have considered owning jointly is a baler for the large rectangular bales (in the range of 30" to 36" square by 6' to 8' feet long) that are sometimes used where hay is shipped longer distances.

These high-capacity machines can cover quite a few acres in an hour, so annual hours of use would be quite low if used on only one farm.

The top section of the table shows how increased annual use shortens the expected trade-in age, if traded at a given number of hours. For example, if the baler covered 16 acres/hour and the farm had 815 acres to harvest/year (two cuttings x 407 acres/cutting), annual usage would be 50 hours. If traded at 600 hours, a baler used 50 hours/year would be traded at twelve years. If usage is increased to 100 hours/year, the same 600 hour trade-in decision rule would point to a trade-in after only six years instead of twelve. The bottom section of the table shows how the increased usage would affect the total cost per acre to own and operate the baler. (The costs shown are for the baler only, not including the tractor or operator labor.) The 600 hour trade-in rule is shown in the first column. Following the first column down to the 50 hours/year shown on the third line, we estimate that the cost/acre would be $8.60/acre. The third line shows the cost if usage were increased to 100 hours or 1,630 acres, cost/acre would fall to $5.68/acre.

Again, both of these cost estimates assume that the baler is traded after 600 hours of use. They also assume that the salvage or trade-in value is determined by the years of age at trade-in, rather than the amount of wear-and-tear. So, the baler is worth more when traded at six years and 600 hours than it would be at twelve years and 600 hours. To be specific, the ASAE formula estimates that after 12 years of use the baler would be worth around 25% of the new price. Trading after only six years, the formula estimates a trade-in value equal to 37% of new.

The ASAE formulas for estimating machinery trade-in values are very useful general guides for estimating machinery costs, but they do have their limitations. One particular limitation is that they only factor in the amount of wear-and-tear (accumulated hours) for tractors and combines, not most implements like balers. The reason they don't consider wear-and-tear for these implements is that the formulas were estimated by economic researchers using auction prices of used equipment as a source (a reference to the original research is available upon request). The database of auction prices also included reported tach hours for tractors and combines that come equipped with tachometers. For other machines without tachometers, wear-and-tear is not factored into the formulas. Wear-and-tear likely does affect trade-in values, however, even though the formulas don't incorporate it. If wear-and-tear is significant, there would be less economic advantage to using the baler more hours/year.

Impact of Annual Usage on Trade-in Age and Cost Per Acre to Own and Operate a Large Rectangular Baler

	Accumulated hours at trade-in			
	600	900	1,200	1,800
Annual use, hrs	- - - Expected years to trade-in - - -			
50	12	18	24	36
75	8	12	16	24
100	6	9	12	18
150	4	6	8	12
200	3	5	6	9
Annual use, hrs	- - Cost/acre (not including tractor, fuel or labor)[a] - -			
50	$8.60	$7.37	$6.63	$5.80
75	$6.78	$5.94	$5.40	$4.78
100	$5.68	$5.06	$4.66	$4.19
150	$4.36	$4.00	$3.75	$3.47
200	$3.58	$3.36	$3.20	$3.03

[a]Tractor, fuel, and labor costs would add $2.33/acre to the amounts shown.

Sugar beet harvesting equipment is another category that is often used in custom work situations. To explore how annual usage affects costs, the 8-row sugar beet lifter on page 11 is shown at two usage levels - 324 acres and 1,013 acres per year, with the latter rate intended to reflect a custom work situation. The custom operator trades the lifter after three years and expects to receive 32% of the list price as a trade. At the lower 80-hour usage level, it is traded at 12 years with a trade-in value 26% of list. The increased usage reduces the total per-acre cost by 11%, from $61.42 down to $54.39 per acre.

THE BOTTOM LINE: Machinery costs are substantial; control of them is important. Custom charges are often based upon them. No one should do custom work unless the charge will cover operating costs and use-related depreciation plus a return for one's risk and time. Ideally, all allocated per acre or hour overhead costs should also be covered by anyone offering to do custom work. The market for custom work usually does not cover all costs. The market is usually somewhere in between the Use-related costs and total costs.

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Summary of Per Acre Use-Related Costs and Total Cost for Implements with Associated Power Units, Averaged Over All Sizes by Implement Type

	Use-Related Cost/Acre[1]	Total Cost/Acre
Chisel Plow	$4.94	$6.64
Chisel Plow, Front Dsk	7.30	9.82
Moldboard Plow	12.67	16.13
Field Cultivator	2.88	3.81
Tandem Disk	4.65	5.90
Tandem Disk H.D.	5.91	7.87
Offset Disk	7.48	9.87
V-Ripper	7.22	9.45
Subsoiler	14.17	17.98
Comb Fld Cult Incorp	4.66	6.23
Comb Disk & V-Ripper	10.72	14.49
Disk,Fld Cult Finish	5.80	7.88
Roller Harrow	3.74	4.98
Row Crop Planter	6.85	10.25
Min-Til Planter	7.34	10.05
Potato Planter	20.76	30.30
Beet Planter	16.32	24.67
Beet Planter, Vacuum	7.68	13.04
Presswheel Drill	7.15	9.67
Air Seeder Drill w/Cart	7.20	10.56
No-Till Drill	10.20	14.12
Cultivator	3.55	4.47
Cultivator High Residue	5.31	7.00
Rotary Hoe	1.46	1.88
Potato Cultivator	4.71	5.97
Sugar Beet Cult	8.29	11.83
Boom Sprayer, Self-Prop	3.64	5.21
Boom Sprayer	1.66	2.06
Hooded Sprayer	3.20	3.90
Anhydrous Applicator	4.72	6.06
Potato Shredder	7.59	9.93
Stalk Shredder	7.02	9.25
Mower-Conditioner	7.69	10.34
Rotary Mow/Cond	5.53	7.72

	Use-Related Cost/Acre[1]	Total Cost/Acre
Hay Rake (Hyd)	6.04	7.04
Hay Swather-Cond	6.85	9.50
Swather-Cond, Self-Prop	8.92	14.55
Grain Swather, Self-Prop	6.33	10.34
Hay Merger	7.48	10.52
Hay Baler PTO Twine	8.44	9.98
Round Baler	12.11	14.17
Rd Baler/Wrap	16.35	19.21
Large Rectangular Baler	5.19	7.60
Forage Harvester (Corn Head)	36.85	46.89
SP Forage Harvster (Corn Head)	31.19	43.58
SP Forage Harvster (Pickup Head, 2X Windrows)	17.38	24.44
Combine w/Corn Head	23.35	29.39
Combine w/Grain Head	14.05	17.50
Combine w/Soybean Hd	21.61	26.93
Combine w/Belt Pickup Head	33.63	41.70
Bean Cutter	5.82	7.38
Bean Rod	5.46	6.80
Bean Windrower	7.97	10.82
Sugar Beet Lifter	52.85	69.88
Sugar Beet Topper	8.94	12.26
Sugar Beet Wagon	18.67	25.89

[1] Use-related cost/acre includes fuel, lubricants, repairs and maintenance, labor, and power and implement depreciation (depreciation is both time-related and use-related). The difference between use-related cost and total cost is that total cost also includes overhead costs (interest, insurance, and housing).

Tractor or Combine HP[1]	Net Cost of a New Power Unit[2]	Annual Hours of Use	Fuel & Oil Cost Per Hour	Maintenance & Repair Cost/Hr	Depreciation Cost Per Hour	--Overhead[3]-- Cost Per Year	Cost Per Hour	--Total Cost-- Per Year Of Use	Per Hour Of Use	Diesel Use/Hr Gallons
Tractors and Combines (Without Heads)										
40	$16,800	400	$4.45	$0.56	$2.23	$845	$2.11	$3,744	$9.36	1.76
60	25,200	400	6.68	0.85	3.35	1,256	3.14	5,605	14.01	2.64
75	31,400	400	8.35	1.11	4.04	1,579	3.95	6,981	17.45	3.30
105 MFWD	63,900	450	11.69	1.92	6.88	3,252	7.23	12,472	27.71	4.62
130 MFWD	79,200	450	14.47	2.38	10.69	3,656	8.12	16,047	35.66	5.72
160 MFWD	94,000	500	17.81	3.13	11.48	4,343	8.69	20,555	41.11	7.04
200 MFWD	115,700	500	22.26	3.86	14.13	5,333	10.67	25,458	50.92	8.80
225 MFWD	131,600	400	25.05	3.51	19.86	6,104	15.26	25,470	63.68	9.90
260 4WD (226 PTO)	131,200	400	25.18	2.10	19.80	6,086	15.22	24,917	62.29	9.95
310 4WD (270 PTO)	135,400	400	30.02	2.17	20.43	6,278	15.70	27,327	68.32	11.87
360 4WD (313 PTO)	153,100	400	34.87	2.45	23.10	7,088	17.72	31,255	78.14	13.78
425 4WD (370 PTO)	184,900	400	41.16	2.96	27.90	8,543	21.36	37,352	93.38	16.27
225 Tracked Tractor	133,300	400	25.05	2.13	20.12	6,182	15.46	25,100	62.75	9.90
220 HP Combine	159,800	300	24.49	26.66	34.95	7,128	23.76	32,959	109.86	9.68
275 HP Combine	177,900	300	30.61	29.68	38.91	7,953	26.51	37,715	125.72	12.10
315 HP SP Forage Harvester Base Unit	136,500	200	19.13	10.35	39.73	6,521	32.61	20,362	101.81	7.56
570 HP SP Forage Harvester Base Unit	202,600	200	34.61	15.35	58.97	9,600	48.00	31,387	156.94	13.68

[1]HP shown for the smaller tractors is PTO horsepower. Engine HP is shown for the larger tractors. PTO HP for the larger tractors runs about 87% of engine HP, and is shown in parentheses. Fuel use is estimated at 0.044 gallons of diesel fuel per hour per PTO HP.

[2]Net cost of a new unit assumes no trade-in. Farm machinery is exempt from sales tax in Minnesota so no sales tax is included.

[3]Overhead costs include interest, insurance, and housing but not depreciation, which is shown separately because it varies to some extent with use. Overhead per hour will vary with annual use.

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre
Tillage Equipment												
Chisel Plow 15 Ft	130 MFWD	11,300	8.50	680	4.02	1.32	0.41	0.94	0.89	7.58	5.74	0.60
Chisel Plow 23 Ft	200 MFWD	19,900	13.03	1,043	3.73	0.86	0.47	1.08	0.98	7.12	5.32	0.60
Chisel Plow 37 Ft	310 4WD (270 PTO)	26,500	20.97	1,677	3.36	0.54	0.39	0.90	0.82	5.99	4.42	0.60
Chisel Plow 57 Ft	425 4WD (370 PTO)	46,500	32.30	2,584	3.15	0.35	0.44	1.02	0.90	5.85	4.29	0.60
Chisel Plow, Front Dsk 16.3 Ft	200 MFWD	17,100	9.21	737	5.57	1.22	0.36	1.32	1.19	9.66	7.30	0.97
Chisel Plow, Front Dsk 21.3 Ft Fold	310 4WD (270 PTO)	27,000	12.04	963	5.64	0.93	0.44	1.59	1.40	9.99	7.29	0.97
Moldboard Plow 4 Bottom-18, 6 Ft	75	13,300	2.78	334	6.53	4.03	2.06	2.26	1.95	16.84	13.47	1.29
Moldboard Plow 5 Bottom-18, 7.5 Ft	105 MFWD	15,000	3.48	417	7.87	3.23	1.86	2.04	1.78	16.77	12.91	1.29
Moldboard Plow 6 Bottom-18, 9 Ft	130 MFWD	17,000	4.17	542	8.34	2.69	1.87	1.78	1.56	16.23	12.73	1.29
Moldboard Plow 8 Bottom-18, 12 Ft	160 MFWD	22,800	5.56	723	7.45	2.02	1.88	1.79	1.55	14.69	11.57	1.29
Field Cultivator 18 Ft	105 MFWD	14,000	12.98	1,558	2.04	0.86	0.37	0.51	0.47	4.25	3.23	0.32
Field Cultivator 23 Ft	130 MFWD	17,500	16.59	1,991	2.08	0.68	0.37	0.50	0.45	4.07	3.13	0.32
Field Cultivator 47 Ft	260 4WD (226 PTO)	39,700	33.90	4,068	1.90	0.33	0.41	0.55	0.49	3.68	2.74	0.32
Field Cultivator 60 Ft	310 4WD (270 PTO)	44,900	43.27	5,193	1.69	0.26	0.36	0.49	0.43	3.23	2.43	0.32
Tandem Disk 11 Ft Rigid	60	3,400	6.40	640	2.40	1.75	0.18	0.31	0.33	4.97	4.15	0.49
Tandem Disk 21 Ft Rigid	160 MFWD	23,600	12.22	1,222	3.16	0.92	0.65	1.14	0.96	6.83	5.15	0.49
Tandem Disk H.D. 30 Ft Fold	360 4WD (313 PTO)	34,000	17.45	1,745	4.48	0.64	0.65	1.15	0.95	7.87	5.91	0.79
Offset Disk 12 Ft	105 MFWD	12,100	5.56	556	4.98	2.02	0.49	1.28	1.10	9.87	7.48	0.83
V-Ripper 25 " O.C., 10 Ft	160 MFWD	11,500	6.18	618	6.28	1.82	0.60	1.05	0.96	10.71	8.35	0.99
V-Ripper 25 " O.C., 18 Ft	260 4WD (226 PTO)	19,400	11.13	1,113	5.85	1.01	0.56	0.99	0.90	9.30	7.04	0.99
V-Ripper 30 " O.C., 17 Ft	260 4WD (226 PTO)	15,700	10.51	1,051	6.04	1.07	0.48	0.85	0.78	9.22	6.99	0.99
V-Ripper 30 " O.C., 22.5 Ft	360 4WD (313 PTO)	21,200	13.91	1,391	5.62	0.81	0.49	0.86	0.78	8.56	6.51	0.99
Subsoiler 30 " O.C., 10 Ft	200 MFWD	15,000	4.12	618	12.08	2.72	1.38	1.38	1.25	18.81	14.97	2.03
Subsoiler 30 " O.C., 15 Ft	310 4WD (270 PTO)	22,600	6.18	927	11.32	1.82	1.39	1.38	1.24	17.15	13.37	2.03

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre
Comb Fld Cult Incorp 16 Ft	160 MFWD	17,400	11.54	1,154	3.42	0.97	0.49	0.85	0.77	6.50	4.98	0.55
Comb Fld Cult Incorp 25 Ft	260 4WD (226 PTO)	29,800	18.03	1,803	3.46	0.62	0.53	0.94	0.84	6.39	4.71	0.55
Comb Fld Cult Incorp 33 Ft	310 4WD (270 PTO)	39,400	23.80	2,380	3.01	0.47	0.53	0.94	0.84	5.80	4.29	0.55
Comb Disk & V-Ripper 17.5 Ft	360 4WD (313 PTO)	30,600	9.02	902	8.51	1.24	0.77	2.00	1.67	14.19	10.56	1.47
Comb Disk & V-Ripper 22.5 Ft	425 4WD (370 PTO)	50,100	11.59	1,159	8.21	0.97	0.98	2.55	2.07	14.79	10.87	1.47
Disk,Fld Cult Finish 22 Ft	200 MFWD	28,300	11.33	1,133	4.28	0.99	0.57	1.42	1.28	8.53	6.31	0.69
Disk,Fld Cult Finish 38 Ft	310 4WD (270 PTO)	44,600	19.58	1,958	3.71	0.57	0.52	1.29	1.15	7.24	5.29	0.69
Roller Harrow 12 Ft	75	11,900	7.42	742	2.03	1.51	0.36	0.95	0.83	5.69	4.32	0.32
Roller Harrow 28 Ft	75	30,800	17.31	1,731	1.33	0.65	0.40	1.01	0.88	4.27	3.16	0.32
Planting Equipment												
Row Crop Planter 6 Row-30, 15 Ft	60	18,000	7.00	490	1.91	2.24	0.75	1.78	1.96	8.64	6.23	0.34
Row Crop Planter 8 Row-30, 20 Ft	75	26,700	9.33	653	1.84	1.68	0.84	1.98	2.15	8.49	5.91	0.34
Row Crop Planter 12 Row-30, 30 Ft	105 MFWD	44,100	14.00	980	2.01	1.12	0.92	2.18	2.36	8.59	5.72	0.34
Row Crop Planter 6 Row-30/15, 15 Ft	60	29,600	7.00	490	1.91	2.24	1.24	2.93	3.15	11.47	7.87	0.34
Row Crop Planter 8 Row-30/15, 20 Ft	75	38,000	9.33	653	1.84	1.68	1.19	2.82	3.02	10.55	7.11	0.34
Row Crop Planter 12 Row-30/15, 30 Ft	105 MFWD	80,500	14.00	980	2.01	1.12	1.69	3.98	4.23	13.02	8.28	0.34
Row Crop Planter 16 Row-30/15, 40 Ft	130 MFWD	99,500	18.67	1,307	2.00	0.84	1.56	3.69	3.90	11.99	7.66	0.34
Row Crop Planter 16 Row-30, 40 Ft	130 MFWD	69,200	18.67	1,307	2.00	0.84	1.09	2.56	2.74	9.23	6.06	0.34
Min-Til Planter 6 Row-30, 15 Ft	75	17,900	6.36	509	2.78	2.46	0.96	1.70	1.88	9.78	7.28	0.53
Min-Til Planter 8 Row-30, 20 Ft	105 MFWD	27,600	8.48	594	3.24	1.85	0.95	2.25	2.45	10.74	7.44	0.53
Min-Til Planter 12 Row-30, 30 Ft	160 MFWD	52,400	12.73	1,273	3.18	1.23	1.79	1.99	2.13	10.33	7.51	0.53
Min-Til Planter 16 Row-30, 40 Ft	200 MFWD	67,600	16.97	2,206	3.04	0.92	2.31	1.48	1.60	9.35	7.12	0.53
Potato Planter 4 Row, 12.6 Ft	130 MFWD	36,700	3.83	214	8.41	7.93	2.20	8.29	8.68	35.50	24.70	1.14
Potato Planter 6 Row, 19 Ft	130 MFWD	48,900	5.75	322	6.56	5.29	1.95	7.36	7.72	28.89	19.75	1.14
Potato Planter 8 Row, 25.3 Ft	160 MFWD	63,600	7.67	429	5.91	3.96	1.90	7.17	7.54	26.49	17.82	1.14
Beet Planter 12 Row, 22 Ft	105 MFWD	36,900	4.67	280	5.94	3.59	1.96	6.38	6.80	24.67	16.32	0.99

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre
Beet Planter, Vacuum 24 Row, 44 Ft	160 MFWD	97,800	22.40	1,008	1.84	0.75	0.79	4.70	4.97	13.04	7.68	0.31
Presswheel Drill 16 Ft	105 MFWD	14,200	6.79	509	3.97	2.21	0.66	1.50	1.44	9.78	7.27	0.64
Presswheel Drill 20 Ft	130 MFWD	20,000	8.48	636	4.11	1.77	0.75	1.69	1.61	9.92	7.35	0.64
Presswheel Drill 25 Ft	130 MFWD	27,100	10.61	795	3.36	1.41	0.81	1.83	1.74	9.15	6.65	0.54
Presswheel Drill 30 Ft	160 MFWD	36,400	12.73	1,018	3.44	1.18	0.97	1.92	1.80	9.31	6.83	0.64
Air Seeder Drill w/Cart 52 Ft	260 4WD (226 PTO)	95,700	22.06	1,765	2.82	0.68	1.47	2.91	2.67	10.56	7.20	0.45
No-Till Drill 15 Ft	130 MFWD	29,400	6.36	509	5.37	2.35	1.57	3.10	2.89	15.29	11.12	0.81
No-Till Drill 20 Ft	160 MFWD	35,900	8.48	679	4.79	1.77	1.44	2.84	2.65	13.48	9.81	0.81
No-Till Drill 30 Ft	200 MFWD	63,500	12.73	1,018	4.29	1.18	1.70	3.35	3.09	13.60	9.67	0.81
Crop Maintenance Equipment												
Cultivator 6 Row-30, 15 Ft	60	5,100	7.73	773	2.07	1.48	0.16	0.37	0.35	4.44	3.68	0.44
Cultivator 8 Row-30, 20 Ft	130 MFWD	6,900	10.30	1,030	3.18	1.11	0.16	0.38	0.36	5.19	4.04	0.44
Cultivator 12 Row-30, 30 Ft	160 MFWD	8,700	15.45	1,545	2.63	0.74	0.13	0.32	0.30	4.12	3.26	0.44
Cultivator 16 Row-30, 40 Ft	200 MFWD	16,900	20.61	2,061	2.52	0.56	0.19	0.47	0.42	4.15	3.21	0.44
Cultivator High Residue 6 Row-30, 15 Ft	105 MFWD	11,700	7.73	773	3.69	1.48	0.36	0.86	0.76	7.15	5.45	0.64
Cultivator High Residue 8 Row-30, 20 Ft	160 MFWD	14,900	10.30	1,030	3.88	1.11	0.34	0.82	0.72	6.87	5.31	0.64
Cultivator High Residue 12 Row-30, 30 Ft	225 MFWD	25,200	15.45	1,545	4.12	0.74	0.38	0.92	0.80	6.97	5.18	0.64
Rotary Hoe 21 Ft	105 MFWD	6,900	25.96	2,596	1.07	0.44	0.07	0.16	0.14	1.88	1.46	0.18
Potato Cultivator 6 Row, 19 Ft	105 MFWD	7,900	8.04	1,126	3.45	1.42	0.35	0.40	0.36	5.97	4.71	0.57
Sugar Beet Cult 12 Row, 22 Ft	105 MFWD	15,900	5.60	336	4.90	2.04	0.36	2.68	2.38	12.36	8.70	0.81
Sugar Beet Cult 24 Row, 44 Ft	200 MFWD	33,600	11.20	672	4.60	1.02	0.38	2.84	2.46	11.29	7.88	0.81
Boom Sprayer, Self-Prop 60 Ft	None	90,300	33.09	3,309	0.54	0.51	1.31	1.55	1.31	5.21	3.64	0.11
Boom Sprayer 50 Ft	60	14,000	25.61	2,561	0.55	0.66	0.26	0.31	0.28	2.06	1.66	0.10
Hooded Sprayer 8 Row, 20 Ft	40	7,500	10.24	819	0.91	1.65	0.33	0.52	0.49	3.90	3.20	0.17
Anhydrous Applicator 21 Ft	160 MFWD	9,000	11.20	840	3.67	1.02	0.20	0.61	0.56	6.06	4.72	0.63
Anhydrous App., No-Till 32 Ft	160 MFWD	24,800	17.07	1,280	2.41	0.67	0.36	1.10	0.95	5.48	4.02	0.41
Potato Shredder 18 Ft	130 MFWD	15,600	6.98	698	5.11	1.73	0.75	1.17	1.18	9.93	7.59	0.82
Stalk Shredder 20 Ft	130 MFWD	17,300	7.76	776	4.60	1.56	0.75	1.16	1.19	9.25	7.02	0.74

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre
Harvesting Equipment												
Mower-Conditioner 9 Ft	40	15,500	4.36	349	2.15	2.77	0.69	2.56	2.17	10.34	7.69	0.40
Rotary Hay Mower 6 Ft	40	2,900	2.91	291	3.22	3.78	0.58	0.52	0.55	8.66	7.38	0.61
Rotary Mow/Cond 9 Ft	75	17,300	6.55	524	2.51	1.76	0.45	1.72	1.68	8.12	5.84	0.44
Rotary Mow/Cond 12 Ft	75	23,111	8.73	698	2.16	1.32	0.45	1.73	1.66	7.33	5.21	0.44
Hay Rake (Hyd) 9 Ft	40	5,100	3.49	698	2.68	3.15	0.39	0.42	0.40	7.04	6.04	0.50
Hay Swather-Cond 12 Ft	60	20,000	5.82	465	2.33	1.89	0.67	2.62	2.10	9.61	6.97	0.42
Hay Swather-Cond 14 Ft	60	24,400	6.79	543	2.15	1.62	0.70	2.74	2.19	9.40	6.74	0.42
Swather-Cond, Self-Prop 16 Ft	None	61,000	7.76	621	2.02	1.42	0.50	5.99	4.62	14.55	8.92	0.40
Grain Swather, Self-Prop 21 Ft	None	55,300	10.18	815	1.54	1.08	0.35	4.13	3.23	10.34	6.33	0.30
Hay Merger 9 Ft	75	16,300	6.11	326	2.86	1.80	0.42	3.05	2.40	10.52	7.48	0.54
Hay Baler PTO Twine 12 Ft	40	18,400	4.36	873	2.15	3.43	2.13	1.22	1.05	9.98	8.44	0.40
Round Baler 1000 Lb, 9 Ft	60	13,800	3.01	603	4.37	4.05	3.93	1.33	1.12	14.81	12.64	0.77
Round Baler 1500 Lb, 12 Ft	60	19,400	4.02	804	3.76	3.04	4.15	1.40	1.17	13.52	11.57	0.77
Rd Baler/Wrap 1000 Lb, 9 Ft	60	22,800	3.01	603	4.65	4.05	6.50	2.19	1.82	19.21	16.35	0.88
Large Rectangular Baler 24 Ft	130 MFWD	64,300	16.29	1,629	2.19	0.75	0.51	2.24	1.91	7.60	5.19	0.35
Forage Harvester (Corn Head) 2 Row, 5 Ft	105 MFWD	27,100	1.38	276	20.10	10.87	5.54	5.58	4.80	46.89	36.85	3.35
Forage Harvester (Pickup Head) 12 Ft	105 MFWD	27,100	3.31	662	8.38	4.53	2.31	2.33	2.00	19.54	15.35	1.40
Corn Head for SP Harvstr Base 3 Row, 7.5 Ft	315 HP SP Forage Harvester Base Unit	9,200	2.55	509	39.64	5.89	0.29	1.44	0.89	48.14	34.44	2.83
Corn Head for SP Harvstr Base 6 Row, 15 Ft	570 HP SP Forage Harvester Base Unit	23,300	5.09	611	31.18	2.94	0.22	3.03	1.63	39.01	27.95	2.83
Pickup Head for SP Harvstr Base 12 Ft	315 HP SP Forage Harvester Base Unit	13,500	4.07	326	25.00	3.68	0.11	3.29	1.90	33.98	24.07	1.86
Pickup Head for SP Harvstr Base (2X Windrows) 24 Ft	570 HP SP Forage Harvester Base Unit	17,200	8.15	652	19.27	1.84	0.07	2.10	1.17	24.44	17.38	1.68
Combine Grain Head 20 Ft	220 HP Combine	14,300	6.79	1,358	15.88	2.21	0.25	0.84	0.43	19.60	15.67	1.31

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre
Combine Grain Head 30 Ft	275 HP Combine	18,200	10.18	2,036	12.65	1.47	0.21	0.71	0.36	15.40	12.43	1.31
Combine Soybean Hd 15 Ft	220 HP Combine	17,200	4.45	891	24.28	3.36	0.45	1.53	0.77	30.40	24.29	2.02
Combine Soybean Hd 18 Ft	275 HP Combine	19,200	5.35	1,069	22.91	2.80	0.42	1.43	0.73	28.28	22.60	2.02
Combine Soybean Hd 25 Ft	275 HP Combine	22,600	7.42	1,485	17.93	2.02	0.35	1.21	0.61	22.12	17.94	2.02
Combine Corn Hd 6 Row-30, 15 Ft	220 HP Combine	28,600	4.20	840	25.21	3.57	0.79	2.70	1.36	33.64	26.62	1.93
Combine Corn Hd 8 Row-30, 20 Ft	220 HP Combine	37,000	5.09	1,018	21.65	2.94	0.85	2.89	1.45	29.78	23.66	1.93
Combine Corn Hd 12 Row-30, 30 Ft	275 HP Combine	58,500	7.64	1,527	17.34	1.96	0.89	3.04	1.51	24.75	19.76	1.93
Combine Belt Pickup Hd 14 Ft	275 HP Combine	11,000	3.56	713	35.28	4.20	0.36	1.23	0.63	41.70	33.63	3.40
Disk Bean Top Cutter 6 Row, 11 Ft	105 MFWD	15,200	6.40	512	4.33	2.34	0.52	1.75	1.44	10.37	7.81	0.72
Bean Cutter 6 Row-30, 15 Ft	130 MFWD	8,700	8.73	698	4.09	1.72	0.22	0.74	0.62	7.38	5.82	0.66
Bean Rod 6 Row-30, 15 Ft	130 MFWD	5,400	8.73	698	4.09	1.72	0.13	0.46	0.40	6.80	5.46	0.66
Bean Windrower 6 Row-30, 15 Ft	130 MFWD	28,300	8.73	698	4.09	1.72	0.70	2.39	1.92	10.82	7.97	0.66
Sugar Beet Lifter 4 Row, 7.3 Ft	105 MFWD	55,200	2.02	162	13.59	7.41	17.68	20.14	15.99	74.81	55.25	2.24
Sugar Beet Lifter 6 Row, 11 Ft	160 MFWD	100,100	3.03	243	13.34	4.94	21.37	24.33	19.28	83.26	61.12	2.24
Sugar Beet Lifter 8 Row, 14.7 Ft[6]	200 MFWD	105,000	4.05	324	12.73	3.70	16.77	19.10	15.13	67.42	49.67	2.24
Sugar Beet Lifter (Higher Usage) 8 Row, 14.7 Ft[6]	200 MFWD	105,000	4.05	1,013	12.73	3.70	15.58	15.99	6.05	54.04	45.36	2.24
Sugar Beet Topper 6 Row, 11 Ft	75	21,500	5.33	427	3.18	2.53	1.23	2.97	2.44	12.35	9.17	0.58
Sugar Beet Topper 8 Row, 14.7 Ft	75	31,500	7.13	570	2.75	1.89	1.35	3.26	2.64	11.89	8.70	0.58
Sugar Beet Topper 12 Row, 22 Ft	160 MFWD	49,400	10.67	853	3.65	1.27	1.42	3.42	2.77	12.52	8.94	0.58
Sugar Beet Wagon 20 Ton, 11 Ft	200 MFWD	47,700	5.20	520	10.06	2.12	2.05	5.41	4.40	24.03	17.58	1.80
Sugar Beet Wagon 24 Ton, 11 Ft	225 MFWD	55,000	5.20	520	11.98	2.12	2.36	6.24	5.05	27.74	19.76	1.80

[1]Net cost of a new unit assumes no trade-in.Farm machinery is exempt from sales tax in Minnesota so no sales tax is included.

Implement	Tractor Size (HP)	Net Cost of A New Implement[1]	- - Estimated - - Work Performed Acres/hr	Acres/yr	Power Cost Per Acre[2]	Labor Cost Per Acre	--Implement Cost/Acre-- Repairs	Deprec-iation	Over-head[3]	Total Cost /Acre[4]	Use-related Cost /Acre[5]	Diesel Fuel Gal/Acre

[2]Power cost per acre for the power unit assigned to each implement multiplied times that implement's acres/hour equals that power unit's total cost per hour shown in the "Tractors and Combines (Without Heads)" table above.

[3]Overhead per acre will vary with annual use.

[4]Total cost/acre is total cost per hour divided by acres per hour. Includes fuel, lubricants, power and equipment repairs and maintenance, labor, and overhead costs including depreciation. Fuel is included in power cost.

[5]Use-related cost/acre includes everything in total cost/acre EXCEPT that non-depreciation overhead costs (interest, insurance, and housing) are omitted. Depreciation is included in use-related cost under the assumption that extra use reduces trade-in value which increases annual depreciation. In other words, depreciation is considered here to be at least partially use-related even though it is commonly thought of as being mainly time-related.

[6]Cost data for the 8 row sugar beet lifter is calculated for two levels of annual usage, 80 and 250 hours.The 250 hours/year is intended to reflect a custom work situation. At the higher usage, the machine is traded after 3 years with a trade-in value of 32% of list price. At the lower 80-hour usage level, it is traded at 12 years with a trade-in value 26% of list.

Implement	Tractor Size (HP)	Net Cost of A New Implement	- - Estimated - - Work Performed Hours/yr	Power Cost Per Hour	Labor Cost Per Hour	--Implement Cost/Hour-- Repairs	Deprec-iation	Overhead	Total Cost Per Hour	Use-related Cost Per Hour	Diesel Fuel Gal/Hour
Miscellaneous - Per Hour Calculations Only											
Ditch Mowing - Rotary Hay Mower	40	2,900	40	$9.36	$11.00	$0.68	$3.78	$4.01	$28.84	$22.71	1.76
Rd Bale Wrapper Silage	60	20,100	150	14.01	11.00	15.05	7.77	6.39	54.22	44.69	2.64
Bale Wrapper Dry Hay	40	8,700	150	9.36	11.00	6.52	3.36	2.84	33.08	28.12	1.76
Manure Spreader 300 Bu,	105 MFWD	13,200	100	27.71	11.00	9.76	7.47	6.48	62.43	48.72	4.62
Liquid Manure Spreader 9500 Gal,	225 Tracked Tractor	48,700	70	62.75	11.00	32.35	39.39	33.99	179.49	130.04	9.90
Grain Cart 500 Bu,	60	15,800	130	14.01	11.00	3.81	7.04	6.18	42.05	32.73	2.64
Grain Cart 1000 Bu,	160 MFWD	27,800	130	41.11	11.00	6.71	12.39	11.25	82.46	62.52	7.04
Gravity Grain Box 240 Bu,	75	3,800	130	17.45	11.00	0.92	1.69	1.90	32.96	27.11	3.30
Loader	75	8,500	50	17.45	11.00	1.82	9.85	7.93	48.06	36.17	3.30
Grain Auger, 70 Ft, 10 Inch-5000 Bu/Hr	60	7,600	130	14.01	11.00	1.83	3.39	2.73	32.96	27.09	2.64

