

### MACHINERY COST ESTIMATES: FIELD OPERATIONS

September 2023

**Table 1. Per Acre Field Operation Costs.**

Operation	Total =	Tractor Overhead +	Implement Overhead +	Fuel & Lube +	Labor	Fuel Use
----- \$ per acre -----						
<b>Primary tillage</b>						gal
Chisel plow	<b>18.40</b>	8.30	6.50	2.50	1.10	0.6
Disk ripper (disk, chisel, rolling bk)	<b>36.40</b>	11.80	15.00	7.80	1.80	2.0
Combination ripper	<b>38.00</b>	12.40	15.70	8.10	1.80	2.1
Vertical tillage, rolling basket	<b>17.60</b>	6.00	9.00	1.80	0.80	0.5
Moldboard plow	<b>53.00</b>	24.50	16.30	7.30	4.90	1.9
Mulch tiller (disk, chisel)	<b>29.00</b>	14.30	7.60	4.30	2.80	1.1
Offset disk	<b>25.30</b>	12.10	7.20	3.60	2.40	0.9
Strip tillage (strips only)	<b>25.90</b>	6.70	14.60	3.60	1.00	0.9
Minimum till ripper	<b>33.70</b>	17.80	4.80	8.50	2.60	2.2
<b>Secondary tillage</b>						
Field cultivator	<b>14.60</b>	4.90	6.90	2.10	0.70	0.5
Mulch finisher (disk, chisel, drag)	<b>22.00</b>	7.60	11.10	2.30	1.00	0.6
Tandem disk	<b>17.80</b>	6.20	8.50	2.00	1.10	0.5
High performance disk	<b>18.20</b>	5.20	8.30	3.90	0.80	1.0
<b>Planting</b>						
Broadcast seeding	<b>6.50</b>	3.70	0.50	0.90	1.40	0.2
Conventional planter	<b>21.40</b>	5.70	12.90	1.70	1.10	0.4
Split-row planter <sup>1</sup>	<b>18.70</b>	5.90	9.80	1.90	1.10	0.5
No-till planter	<b>23.30</b>	5.90	14.40	1.90	1.10	0.5
Grain drill	<b>20.20</b>	7.30	8.90	2.00	2.00	0.5
No-till drill	<b>36.00</b>	12.10	17.20	3.40	3.30	0.9
Air disk drill with commodity cart	<b>33.80</b>	7.80	22.70	2.30	1.00	0.6
<b>Crop care</b>						
Rotary hoe	<b>8.00</b>	2.80	3.60	0.80	0.80	0.2
Row cultivating	<b>19.20</b>	6.60	9.20	2.10	1.30	0.5
<b>Spraying and ammonia application</b>						
Self-propelled	<b>5.80</b>		5.50	0.10	0.20	0.0
Pull-type	<b>5.80</b>	1.20	3.80	0.30	0.50	0.1
Anhydrous ammonia	<b>21.10</b>	7.10	10.90	2.10	1.00	0.5
Liquid fertilizer applicator	<b>9.70</b>	3.70	4.20	1.10	0.70	0.3
<b>Mowing<sup>2</sup></b>	<b>34.40</b>	14.60	11.70	4.10	4.00	1.1

<sup>1</sup> Cost applies to soybean acres only.

<sup>2</sup> Mowing costs are \$200.10 per hour

Table 1 shows estimated costs of performing agricultural field operations. These estimates are useful for determining custom rates and for analyzing machinery costs on farms. Costs include overhead (depreciation, interest, insurance, housing and repairs), fuel and labor charges. Not included are allowances for profit. Charging custom rates at estimated costs should cover all costs, but will not generate a profit. Adding 5 to 15 percent to estimated costs is appropriate for setting custom rates.

## Cost Estimates

Formulas published by the American Society of Agricultural Engineers are used to calculate costs. All costs are based on buying new machinery and owning machinery for 10 years. Variables used in calculating costs are shown in Table 2.

Costs in Table 1 are divided into four categories:

**Tractor overhead** includes depreciation, interest, insurance, housing, and repair charges for the tractor used to pull the implement.

**Implement overhead** includes depreciation, interest, insurance, housing, and repair charges for the implement.

**Fuel charges** are based on diesel fuel priced at \$3.50 per gallon. Lubrication cost is calculated as 10 percent of fuel cost.

**Labor costs** are based on a \$21.00 per hour labor charge. Labor time is 10 percent more than hours for the tractor or self-propelled machine.

Costs shown in Table 1 are estimated for a specific implement size generally associated with a 1,400 acre grain farm. Estimated costs for these and other sized implements are shown in Appendix Table 1. Usually, but not always, total per acre costs decrease slightly as implement size increase. However, total costs for different sized implements do not differ greatly when acres covered are matched to the size of the implement.

## Use and Costs

The majority of costs associated with machinery are overhead, including costs for depreciation, interest, insurance, housing, and repair. On an annual basis, depreciation and interest are relatively constant no matter how many acres are covered. As acres increase, yearly depreciation and interest costs are spread over more acres for a given implement size. Therefore, costs per acre decline as acres of use increase for a given implement size.

Appendix Table 1 lists acres used to calculate total costs per acre. On average, acreage decreases of 50 percent result in 80% increases in costs. Acreage increases of 50 percent result in cost decreases of 25 percent. Fuel and labor costs per acre are constant regardless of acres covered.

Prepared by: Dale Lattz and Gary Schnitkey, Department of Agricultural and Consumer Economics, University of Illinois.

**Appendix Table 1. Costs for Different Sized Implements.**

Implement/size	Tractor HP	List Price	-- Acres per --		Costs per Hour	----- Costs per Acre -----					
			Hour	Year		Tractor Total = Overhead	Implement + Overhead	Fuel + & Lube	+ Labor	Fuel Use Per Acre	
		\$	ac/hr	ac/yr	\$/hr	----- \$ per acre -----					gal.
<b>Chisel plow</b>											
21 ft.	205	64,286	12.6	882	268.40	<b>21.30</b>	9.20	7.60	2.70	1.80	0.7
23 ft.	225	75,426	13.8	966	292.60	<b>21.20</b>	8.70	8.10	2.70	1.70	0.7
27 ft.	260	81,344	16.2	1,134	346.70	<b>21.40</b>	9.80	7.50	2.70	1.40	0.7
30 ft.	285	86,858	18.0	1,260	365.40	<b>20.30</b>	9.10	7.20	2.70	1.30	0.7
35 ft.	310	92,301	21.0	1,470	386.40	<b>18.40</b>	8.30	6.50	2.50	1.10	0.6
40 ft.	390	95,294	24.0	1,680	386.40	<b>16.10</b>	6.50	5.90	2.70	1.00	0.7
44 ft.	440	131,584	26.4	1,848	459.40	<b>17.40</b>	6.30	7.40	2.80	0.90	0.7
47 ft.	440	138,250	28.2	1,974	468.10	<b>16.60</b>	5.90	7.30	2.60	0.80	0.7
55 ft.	490	148,898	33.0	2,310	508.20	<b>15.40</b>	5.50	6.70	2.50	0.70	0.6
61 ft.	590	161,427	36.6	2,562	560.00	<b>15.30</b>	5.50	6.50	2.70	0.60	0.7
<b>Disk ripper (disk, chisel, rolling basket)</b>											
12 ft.	205	66,657	7.2	504	291.60	<b>40.50</b>	16.10	13.70	7.50	3.20	1.9
17 ft.	310	84,998	10.2	714	404.90	<b>39.70</b>	17.00	12.40	8.00	2.30	2.1
22 ft.	390	133,407	13.2	924	480.50	<b>36.40</b>	11.80	15.00	7.80	1.80	2.0
27 ft.	490	154,766	16.2	1,134	537.80	<b>33.20</b>	9.60	14.20	8.00	1.40	2.1
<b>Combination ripper (disk, disk, ripper, closing disk, rolling basket)</b>											
14 ft.	310	109,227	9.8	686	440.00	<b>44.90</b>	17.70	16.50	8.30	2.40	2.1
18 ft. rigid	390	133,032	12.6	882	478.80	<b>38.00</b>	12.40	15.70	8.10	1.80	2.1
18 ft. folding	390	145,926	12.6	882	497.70	<b>39.50</b>	12.40	17.20	8.10	1.80	2.1
22 ft.	490	181,106	15.4	1,078	577.50	<b>37.50</b>	10.10	17.50	8.40	1.50	2.2
26 ft.	590	211,440	18.2	1,274	649.70	<b>35.70</b>	8.60	17.30	8.50	1.30	2.2
<b>Vertical tillage, rolling basket</b>											
25 ft. 3 in.	260	137,193	22.7	1,591	429.50	<b>18.90</b>	7.00	9.00	1.90	1.00	0.5
30 ft. 3 in.	285	165,132	27.2	1,906	479.20	<b>17.60</b>	6.00	9.00	1.80	0.80	0.5
33 ft. 10 in.	390	182,003	30.4	2,131	517.60	<b>17.00</b>	5.10	8.90	2.20	0.80	0.6
43 ft. 6 in.	440	240,491	39.2	2,741	622.50	<b>15.90</b>	4.30	9.10	1.90	0.60	0.5
49 ft. 6 in.	590	277,732	44.6	3,119	735.10	<b>16.50</b>	4.50	9.30	2.20	0.50	0.6
<b>Moldboard plow</b>											
6 bottom	175	62,883	4.1	486	213.00	<b>52.60</b>	23.10	16.50	7.30	5.70	1.9
7 bottom	205	72,191	4.7	567	250.40	<b>53.00</b>	24.50	16.30	7.30	4.90	1.9
9 bottom	260	100,730	6.1	729	332.30	<b>54.70</b>	26.10	17.60	7.20	3.80	1.9
10 bottom	285	111,688	6.8	810	353.70	<b>52.40</b>	24.30	17.60	7.10	3.40	1.8
<b>Mulch tiller (disk, chisel shanks)</b>											
11 ft. 3 in.	140	29,754	5.6	394	176.10	<b>31.30</b>	15.10	7.90	4.20	4.10	1.1
13 ft. 9 in.	175	36,869	6.9	481	201.40	<b>29.30</b>	13.60	8.00	4.30	3.40	1.1
16 ft. 3 in.	205	41,496	8.1	569	235.60	<b>29.00</b>	14.30	7.60	4.30	2.80	1.1
18 ft. 9 in.	240	62,350	9.4	656	281.30	<b>30.00</b>	13.30	9.90	4.30	2.50	1.1
21 ft. 3 in.	260	65,389	10.6	744	321.90	<b>30.30</b>	14.90	9.10	4.10	2.20	1.1
<b>Offset disk</b>											
10 ft.	120	39,896	6.0	420	180.60	<b>30.10</b>	12.90	9.90	3.40	3.90	0.9
14 ft.	155	43,831	8.4	588	203.30	<b>24.20</b>	10.60	7.70	3.10	2.80	0.8
16 ft.	205	46,374	9.6	672	242.90	<b>25.30</b>	12.10	7.20	3.60	2.40	0.9

**Appendix Table 1. Costs for Different Sized Implements, cont.**

Implement/size	Tractor HP	List Price	-- Acres per --		Costs	----- Costs per Acre -----					
			Hour	Year	per Hour	<b>Total</b>	Tractor = Overhead	Implement + Overhead	Fuel + & Lube	+ Labor	Fuel Use Per Acre
	HP	\$	ac/hr	ac/yr	\$/hr	----- \$ per acre -----					gal.
<b>Strip till (strips only)</b>											
12-row	285	128,840	17.5	1,222	480.00	<b>27.50</b>	9.40	14.00	2.80	1.30	0.7
16-row	490	179,456	23.3	1,629	602.80	<b>25.90</b>	6.70	14.60	3.60	1.00	0.9
<b>Minimum till ripper</b>											
7 ft. 6 in.	205	17,924	3.8	263	200.30	<b>53.40</b>	30.90	7.10	9.20	6.20	2.4
10 ft.	260	18,980	5.0	350	253.50	<b>50.70</b>	31.70	5.60	8.80	4.60	2.3
12 ft. 6 in.	310	20,369	6.3	438	279.40	<b>44.70</b>	27.80	4.80	8.40	3.70	2.2
17 ft. 6 in.	440	28,304	8.8	613	294.90	<b>33.70</b>	17.80	4.80	8.50	2.60	2.2
22 ft. 6 in.	590	37,629	10.8	753	334.30	<b>31.10</b>	14.50	5.20	9.30	2.10	2.4
<b>Mulch finisher (disk, chisel, and drag)</b>											
24 ft. 9 in.	240	109,581	14.9	1,040	351.90	<b>23.70</b>	8.40	11.00	2.70	1.60	0.7
27 ft. 9 in.	260	125,486	16.7	1,166	411.30	<b>24.70</b>	9.50	11.20	2.60	1.40	0.7
30 ft. 9 in.	285	140,519	18.5	1,292	444.60	<b>24.10</b>	8.90	11.30	2.60	1.30	0.7
33 ft. 9 in.	285	148,249	20.3	1,418	455.60	<b>22.50</b>	8.10	10.90	2.40	1.10	0.6
38 ft. 3 in.	310	171,221	23.0	1,607	504.90	<b>22.00</b>	7.60	11.10	2.30	1.00	0.6
44 ft. 3 in.	390	202,286	26.6	1,859	546.90	<b>20.60</b>	5.90	11.30	2.50	0.90	0.6
50 ft. 3 in.	490	225,755	30.2	2,111	597.00	<b>19.80</b>	5.20	11.10	2.70	0.80	0.7
56 ft. 3 in.	590	241,244	33.8	2,363	634.50	<b>18.80</b>	4.60	10.60	2.90	0.70	0.7
<b>Field cultivator</b>											
31 ft. 6 in.	240	68,381	20.6	1,442	290.40	<b>14.10</b>	6.10	4.90	2.00	1.10	0.5
35 ft. 6 in.	285	82,834	23.2	1,625	359.80	<b>15.50</b>	7.10	5.30	2.10	1.00	0.5
44 ft. 6 in.	310	139,268	29.1	2,037	456.90	<b>15.70</b>	6.00	7.10	1.80	0.80	0.5
48 ft. 6 in.	390	148,061	31.7	2,220	463.10	<b>14.60</b>	4.90	6.90	2.10	0.70	0.5
52 ft. 6 in.	390	153,418	34.7	2,432	476.00	<b>13.70</b>	4.50	6.60	1.90	0.70	0.5
56 ft. 6 in.	440	161,372	37.4	2,617	493.60	<b>13.20</b>	4.20	6.40	2.00	0.60	0.5
60 ft. 6 in.	490	164,043	40.0	2,803	508.50	<b>12.70</b>	3.90	6.10	2.10	0.60	0.5
64 ft. 6 in.	590	189,574	42.7	2,988	559.20	<b>13.10</b>	3.70	6.60	2.30	0.50	0.6
69 ft. 6 in.	640	201,072	46.0	3,220	584.20	<b>12.70</b>	3.40	6.50	2.30	0.50	0.6

**Appendix Table 1. Costs for Different Sized Implements, cont.**

Implement/size	Tractor HP	List Price	-- Acres per Hour	-- Year	Costs per Hour	----- Costs per Acre -----					
						Total =	Tractor Overhead	Implement + Overhead	Fuel + & Lube	+ Labor	Fuel Use Per Acre
	HP	\$	ac/hr	ac/yr	\$/hr	----- \$ per acre -----					gal.
<b>Tandem disk</b>											
23 ft. 7 in.	175	85,858	14.2	996	274.70	<b>19.30</b>	6.60	9.00	2.10	1.60	0.5
26 ft. 5 in.	205	94,971	15.9	1116	314.20	<b>19.70</b>	7.30	8.80	2.20	1.40	0.6
29 ft. 3 in.	225	101,971	17.7	1236	331.90	<b>18.80</b>	6.80	8.60	2.10	1.30	0.5
33 ft. 7 in.	240	116,032	20.3	1419	360.80	<b>17.80</b>	6.20	8.50	2.00	1.10	0.5
40 ft. 8 in.	285	153,077	24.5	1718	464.00	<b>18.90</b>	6.70	9.30	2.00	0.90	0.5
44 ft. 11 in.	310	187,901	27.2	1901	529.70	<b>19.50</b>	6.40	10.30	1.90	0.90	0.5
<b>High performance disk</b>											
17 ft. 7 in.	260	113,021	17.6	1231	416.60	<b>23.70</b>	9.00	9.50	3.90	1.30	1.0
24 ft. 4 in.	310	121,176	24.3	1703	457.50	<b>18.80</b>	7.10	7.40	3.40	0.90	0.9
30 ft.	440	168,064	30.0	2100	546.00	<b>18.20</b>	5.20	8.30	3.90	0.80	1.0
35 ft.	490	185,050	35.0	2450	588.00	<b>16.80</b>	4.50	7.90	3.70	0.70	1.0
40 ft.	590	198,640	40.0	2800	632.00	<b>15.80</b>	3.90	7.40	3.90	0.60	1.0
<b>Broadcast seeding</b>											
40 ft.	85	3,919	16.1	716	104.60	<b>6.50</b>	3.70	0.50	0.90	1.40	0.2
<b>Conventional planter</b>											
6-row	120	51,105	7.6	535	194.70	<b>25.50</b>	10.10	9.80	2.60	3.00	0.7
8-row	140	62,788	10.2	713	224.00	<b>22.00</b>	8.30	9.10	2.30	2.30	0.6
12-row	175	165,119	15.3	1069	387.90	<b>25.40</b>	6.10	15.90	1.90	1.50	0.5
16-row	205	178,146	20.4	1425	435.80	<b>21.40</b>	5.70	12.90	1.70	1.10	0.4
24-row	240	274,918	30.5	2138	592.60	<b>19.40</b>	4.10	13.20	1.30	0.80	0.3
32-row	260	493,151	40.7	2851	953.00	<b>23.40</b>	3.90	17.80	1.10	0.60	0.3
36-row	310	531,076	45.8	3207	1030.90	<b>22.50</b>	3.80	17.10	1.10	0.50	0.3
<b>Split-row planter (soybean acres only)<sup>2</sup></b>											
12-row split	205	59,679	15.3	535	329.90	<b>21.60</b>	7.60	10.20	2.30	1.50	0.6
16-row split	225	76,191	20.4	713	380.80	<b>18.70</b>	5.90	9.80	1.90	1.10	0.5
<b>No-till planter (30" rows)</b>											
8-row	140	66,892	10.2	713	230.10	<b>22.60</b>	8.30	9.70	2.30	2.30	0.6
12-row	175	181,225	15.3	1069	412.40	<b>27.00</b>	6.10	17.50	1.90	1.50	0.5
16-row	225	199,394	20.4	1425	474.50	<b>23.30</b>	5.90	14.40	1.90	1.10	0.5
24-row	260	287,230	30.5	2138	647.60	<b>21.20</b>	5.20	13.80	1.40	0.80	0.4
<b>Grain drill</b>											
13 ft.	110	27,529	6.1	346	164.40	<b>27.10</b>	12.40	7.80	3.10	3.80	0.8
25 ft.	140	60,775	11.7	666	235.70	<b>20.20</b>	7.30	8.90	2.00	2.00	0.5
30 ft.	175	77,255	14.0	799	278.60	<b>19.90</b>	6.70	9.40	2.10	1.70	0.5
35 ft.	225	92,035	16.3	933	338.10	<b>20.70</b>	7.40	9.60	2.30	1.40	0.6
<b>No-till drill</b>											
10 ft.	110	60,899	4.7	267	221.20	<b>47.40</b>	16.10	22.30	4.00	5.00	1.0
15 ft.	140	70,246	7.0	400	252.00	<b>36.00</b>	12.10	17.20	3.40	3.30	0.9
20 ft.	175	103,565	9.3	533	323.90	<b>34.70</b>	10.00	19.00	3.20	2.50	0.8

**Appendix Table 1. Costs for Different Sized Implements, cont.**

Implement/size	Tractor HP	List Price	-- Acres per --		Costs per Hour	----- Costs per Acre -----					
			Hour	Year		Total	= Tractor Overhead	+ Implement Overhead	+ Fuel & Lube	+ Labor	Fuel Use Per Acre
	HP	\$	ac/hr	ac/yr	\$/hr	----- \$ per acre -----					gal.
Air disk drill with commodity cart											
28 ft.	285	195,192	14.3	814	568.80	<b>39.90</b>	11.50	23.40	3.40	1.60	0.9
36 ft.	285	267,957	18.3	1,046	694.60	<b>37.90</b>	9.00	25.00	2.60	1.30	0.7
44 ft.	310	297,761	22.4	1,279	757.10	<b>33.80</b>	7.80	22.70	2.30	1.00	0.6
Rotary hoe											
30 ft.	140	15,427	30.2	400	241.50	<b>8.00</b>	2.80	3.60	0.80	0.80	0.2
41 ft.	225	27,865	41.2	547	379.50	<b>9.20</b>	2.90	4.80	0.90	0.60	0.2
Row-crop cultivator (30" rows)											
8-row	140	33,526	9.1	400	205.50	<b>22.70</b>	9.40	8.10	2.60	2.60	0.7
12-row	155	60,004	13.6	604	268.90	<b>19.80</b>	6.60	9.60	1.90	1.70	0.5
16-row	225	76,787	18.1	806	347.70	<b>19.20</b>	6.60	9.20	2.10	1.30	0.5
Self-propelled sprayer (High-crop ready)											
80 ft. boom	85	324,149	64.5	5,352	425.60	<b>5.70</b>		5.10	0.20	0.40	0.1
90 ft. boom	85	488,564	72.5	6,021	587.60	<b>7.30</b>		6.80	0.20	0.30	0.1
100 ft. boom	85	491,379	80.6	6,690	596.50	<b>6.70</b>		6.20	0.20	0.30	0.1
Self-propelled sprayer											
120 ft boom	85	526,251	96.7	8,028	619.10	<b>5.80</b>		5.50	0.10	0.20	0.0
Field Sprayer											
90 ft.	95	71,250	49.6	1,985	287.90	<b>5.80</b>	1.20	3.80	0.30	0.50	0.1
Anhydrous ammonia applicator											
27 ft. 6 in.	175	108,719	13.3	933	350.70	<b>26.30</b>	7.00	15.40	2.20	1.70	0.6
37 ft. 6 in.	240	136,510	18.2	1,273	447.30	<b>24.60</b>	6.90	14.20	2.20	1.30	0.6
47 ft. 6 in.	285	132,781	23.0	1,612	485.90	<b>21.10</b>	7.10	10.90	2.10	1.00	0.5
62 ft. 6 in.	490	156,437	30.3	2,121	560.60	<b>18.50</b>	5.20	9.80	2.70	0.80	0.7
Liquid fertilizer applicator											
40 ft.	205	68,250	31.0	2,172	301.00	<b>9.70</b>	3.70	4.20	1.10	0.70	0.3
60 ft.	260	93,000	46.5	3,258	400.30	<b>8.60</b>	3.40	3.80	0.90	0.50	0.2
Field and ditch mowing											
15 ft.	140	31,038	5.8	291	200.10	<b>34.40</b>	14.60	11.70	4.10	4.00	1.1
20 ft.	140	40,913	7.8	388	221.10	<b>28.50</b>	10.90	11.60	3.00	3.00	0.8