
Self-Propelled Harvesting and Spraying: Machinery Ownership Versus Custom Hire

Custom operators harvest approximately 30 percent of the crop acres in Iowa. They play a crucial part in making harvesting more timely and efficient. The decision to own or custom hire a combine can involve many thousands of dollars. Similar considerations apply to other self-propelled machines, such as forage harvesters, windrowers and sprayers.

Ownership

Most crop producers prefer to own their own harvesting or spraying equipment. They provide labor to operate the machine, assume responsibility for repairs and maintenance, and assume all the risk of obsolescence. The owner also gains complete control over machine scheduling and timeliness, as well as the quality of the work performed.

The large initial investment can be a barrier to ownership, however. Even though ownership may be profitable over the long run, the owner may have to pay for the machine in only a few years. Some owners look for acres to custom harvest or spray in addition to their own, to help pay the machinery ownership costs.

Joint ownership allows responsibility for investment, repairs, and labor to be shared with someone else. Joint ownership may generate enough use to make owning a machine profitable when it would not be profitable for one owner alone. However, cooperation is absolutely essential. The parties must approve of each other's use and care of the machine. The process for scheduling between farms should be worked out ahead of time, and all owners need to agree on who has responsibility for operating the machines and making repairs. For more information on joint ownership see *AgDM File A3-34, [Joint Machinery Ownership](#) (PM 1373)*.

Leasing also has become popular for large investment items such as combines, as an alternative to ownership. However, the lessee still has full responsibility for operating and maintaining the machine. Leasing may require smaller annual payments than financing the same machine on a purchase plan, but the operator does not have any ownership or equity value at the end of the lease period. For more information on leasing machinery see *AgDM File A3-35, [Machinery Leasing – Is it for You?](#)*.



Custom Hiring

Custom hiring allows a farmer to gain short-term control of a harvester or sprayer without investing a large amount of capital. It has several advantages compared with owning.

Advantages

- The machine comes with an operator. That means that the hiring farmer has no responsibility for operating or maintaining the machine. Also, the farmer can perform other tasks such as hauling and unloading grain while the combine is operating, without having to hire extra help. This is an important advantage for farmers with a limited labor supply.

- There is no long-term capital investment in the machine. The cost of custom hiring can be paid from operating capital.
- The hiring farmer has no responsibility or repair costs.
- There is no responsibility for liquidation of the machine if production practices or farm size change and it is no longer needed.
- The farmer pays only for the number of acres actually harvested or sprayed, which may vary from year to year.
- The custom operator's machine is more likely to be a recent model and in good mechanical condition.
- Some custom operators provide grain trucks, carts, or wagons as well as the combine.

Custom hiring also may have some disadvantages, but their severity will depend on the local situation.

Disadvantages

- There may not be a competent operator and machine available nearby.
- The hiring farmer will not be operating the machine and will not have complete control over the quality of the job performed.
- The custom operator may not be able to harvest or spray the crop when it is convenient for the owner nor during the optimum time period. Problems could arise if the weather is bad and the custom operator has several other farmers waiting. A schedule or priority list needs to be worked out ahead of time.

Custom Charges

Charges for custom harvesting or spraying should be agreed on in advance. Rates should take into account the condition of the crop being harvested, the size of the field, presence of terraces, contour rows, streams, etc., speed and quality of the work performed, the use of specialized harvesting heads, extra services

provided, and the timeliness of the operations. Many operators rely on information from AgDM File A3-10, [Iowa Farm Custom Rate Survey \(FM 1698\)](#). This survey is updated annually. Actual rates may vary from the average rates shown due to the factors mentioned above.

Custom operators who supply grain carts, wagons or trucks, with operators, may either charge separately for these services or charge one rate per acre that covers complete harvesting and hauling to storage or sale.

Estimating Costs

Custom operators need to know their actual costs. Crop producers need to compare the costs of owning their own machines to the cost of custom hiring. The worksheet in this publication lists the steps needed to do this.

Tables 1, 2, 3, 4 and 5 list estimated field capacities, fuel consumption, salvage values, capital recovery factors, and repair cost rates that can be used if actual data are not available. For the interest rate, consider what the intermediate term loan rate is, what the equity capital could earn if it were invested in a use other than the combine, or an average of the two rates.

At the end of the worksheet the number of acres for which ownership and custom hiring are equal in cost can be calculated. For owners with fewer acres than this, a second calculation shows the number of additional custom acres that would have to be harvested or sprayed to generate enough income to break even.

The worksheet is also available as AgDM *Decision Tool*, [Self-Propelled Harvesting and Spraying: Ownership Versus Custom Hire](#).

Table 1. Average field speed, efficiency, and capacity.

Machine type & size, feet	Speed, miles/hour	Field efficiency, %	Field Capacity acres/hour*
Combine, soybeans and small grains			
15'	3.8	73	5.0
17'6"	3.8	73	5.2
20'	3.8	70	6.4
22'6"	3.8	70	7.3
25'	3.8	70	8.1
30'	3.8	68	9.4
36'	3.8	68	11.3
Combine, corn			
4-30 rows	3.8	73	3.4
6-30 rows	3.8	73	5.0
8-30 rows	3.8	70	6.4
12-30 rows	3.8	68	9.4
4-38 rows	3.8	73	4.3
6-38 rows	3.8	73	6.4
8-38 rows	3.8	70	8.2
Self-propelled windrower			
15'	6.5	83	9.8
18'	6.5	80	11.3
21'	6.5	80	13.2
25'	6.5	78	15.4
30'	6.5	78	18.4
Self-propelled forage harvester			
2-row	3.7	73	1.6
3-row	3.7	71	2.4
4-row	3.7	70	3.2
6-row	3.7	70	4.7
Sprayer			
60'	12	65	57
90'	12	65	85
100'	12	65	95
120'	12	65	113

*Equal to width (in feet) x speed x field efficiency / 8.25.

Source: AgDM File A3-24, [Estimating the Field Capacity of Farm Machinery](#) (PM 696)

Table 2. Diesel fuel consumption estimates for harvesting and spraying.

Operation	Gallons per acre
Combine soybeans or small grain	1.00
Combine corn	1.45
Harvest haylage	1.15
Harvest corn silage	3.25
Windrow	0.45
Spray	0.13

Source: AgDM File A3-27, [Fuel Required for Field Operations](#) (PM 709).

Table 3. Estimated on-farm remaining value as a percentage of current list price.

At the end of year	Self-propelled combine and forage harvesters Annual hours of use			Self-propelled windrowers and swathers	Self-propelled sprayers
	100	300	500		
1	79%	69%	63%	49%	65%
2	67%	58%	52%	44%	60%
3	59%	50%	45%	40%	56%
4	52%	44%	39%	37%	53%
5	47%	39%	34%	35%	50%
6	42%	35%	30%	32%	48%
7	38%	31%	27%	30%	46%
8	35%	28%	24%	28%	44%
9	31%	25%	21%	27%	42%
10	28%	23%	19%	25%	41%
11	26%	20%	17%	24%	39%
12	23%	18%	15%	23%	38%
13	21%	16%	13%	21%	36%
14	19%	14%	12%	20%	35%
15	17%	13%	10%	19%	34%
16	16%	11%	9%	18%	33%
17	14%	10%	8%	17%	32%
18	13%	9%	7%	16%	31%
19	11%	8%	6%	16%	30%
20	10%	7%	5%	15%	29%

Source: AgDM File A3-29, [Estimating Farm Machinery Costs](#) (PM 710).

Table 4. Capital recovery factors for interest and depreciation costs.

Interest rate:	4%	5%	6%	7%	8%	9%	10%	11%
Years								
1	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110
2	0.530	0.538	0.545	0.553	0.561	0.568	0.576	0.584
3	0.360	0.367	0.374	0.381	0.388	0.395	0.402	0.409
4	0.275	0.282	0.289	0.295	0.302	0.309	0.315	0.322
5	0.225	0.231	0.237	0.244	0.250	0.257	0.264	0.271
6	0.191	0.197	0.203	0.210	0.216	0.223	0.230	0.236
7	0.167	0.173	0.179	0.186	0.192	0.199	0.205	0.212
8	0.149	0.155	0.161	0.167	0.174	0.181	0.187	0.194
9	0.134	0.141	0.147	0.153	0.160	0.167	0.174	0.181
10	0.123	0.130	0.136	0.142	0.149	0.156	0.163	0.170
11	0.114	0.120	0.127	0.133	0.140	0.147	0.154	0.161
12	0.107	0.113	0.119	0.126	0.133	0.140	0.147	0.154
13	0.100	0.106	0.113	0.120	0.127	0.134	0.141	0.148
14	0.095	0.101	0.108	0.114	0.121	0.128	0.136	0.143
15	0.090	0.096	0.103	0.110	0.117	0.124	0.131	0.139
16	0.086	0.092	0.099	0.106	0.113	0.120	0.128	0.136
17	0.082	0.089	0.095	0.102	0.110	0.117	0.125	0.132
18	0.079	0.086	0.092	0.099	0.107	0.114	0.122	0.130
19	0.076	0.083	0.090	0.097	0.104	0.112	0.120	0.128
20	0.074	0.080	0.087	0.094	0.102	0.110	0.117	0.126

Table 5. Accumulated repair and maintenance costs, as a percentage of current list price.

Accumulated hours of use	Self-propelled combine, %	Self-propelled forage harvester, %	Self-propelled windrower, %	Self-propelled sprayer, %
300	0	0	1	2
600	1	1	2	5
900	2	2	5	9
1,200	4	4	9	13
1,500	6	7	14	17
1,800	9	10	19	21
2,100	12	13	26	26
2,400	16	17	35	31
2,700	20	22	44	36
3,000	25	27	54	42

Source: AgDM File A3-29, [Estimating Farm Machinery Costs \(PM 710\)](#).

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Worksheet for Comparing Ownership and Custom Hiring

	<u> Corn </u>	<u>Soybeans and Small Grain</u>	<u> Total </u>
A. Annual Use			
1. Acres harvested or sprayed annually, own crops	_____A	_____A	_____A
2. Acres harvested or sprayed annually for others	_____A	_____A	_____A
3. Total acres: (A1 + A2)	_____A	_____A	_____A
4. Acres per hour (see Table 1, or use own estimate):	_____A/hr	_____A/hr	
5. Total annual hours of use: (A3 / A4)	_____hr	_____hr	_____hr
6. Fuel used per acre (see Table 2, or use own estimate):	_____gal/A	_____gal/A	
7. Annual fuel use: (A3 x A6)	_____gal	_____gal	_____gal
B. Ownership Costs			
1. Total purchase cost of machine and harvesting heads, including value of items traded			\$ _____
2. New list price of comparable machine and heads			\$ _____
3. Age of machine at purchase (zero if purchased new)			_____yr
4. Expected number of years machine will be owned			_____yr
5. Age of machine at end of ownership period: (B3 + B4)			_____yr
6. Expected salvage value after (B5) _____ years: Table 3 factor _____% x B2			\$ _____
7. Total depreciation: (B1 - B6)			\$ _____
8. Interest rate _____% (average of loan rate and equity rate) minus inflation rate _____%			_____%
9. Capital recovery factor (Table 4) for interest rate (B8) and years (B4)			_____
10. Annual capital recovery charge (depreciation, interest): (B6 x B8) + (B7 x B9)			\$ _____
11. Annual charge for insurance and housing: 1% x B1			\$ _____
12. Total annual ownership cost: (B10 + B11)			\$ _____
C. Operating Costs			
1. Annual fuel cost: A7 x fuel price, \$ _____ per gallon			\$ _____
2. Annual lubrication cost: C1 x .15			\$ _____
3. Accumulated hours of use on machine when purchased (zero if new)			_____hr
4. Repair cost % from Table 5 for the hours from C3			_____%
5. Estimated hours of accumulated use at end of ownership period: (A5 x B4) + C3			_____hr
6. Repair cost % from Table 5 for the hours from C5			_____%
7. Net repair cost %: (C6 - C4)			_____%
8. Annual repair costs: (B2 x C7) / B4, or use own estimate			\$ _____
9. Labor value: A5 x 1.2 x wage, \$ _____ per hr			\$ _____
10. Value of other labor: _____ hr x wage, \$ _____ per hr			\$ _____
11. Total annual operating costs: (C1 + C2 + C8 + C9 + C10)			\$ _____

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Worksheet for Comparing Ownership and Custom Hiring (continued)

	<u>Corn</u>	<u>Soybeans and Small Grain</u>	<u>Total</u>
D. Custom Hire Costs			
1. Custom charge per acre (cost)	\$ _____/A	\$ _____/A	
2. Custom hire charge per year: (A1 x D1)	\$ _____	\$ _____	\$ _____
3. Extra (+) or reduced (-) field loss from custom hire: (skip to D7 if none expected)	_____ %	_____ %	
4. Expected yield	_____ bu/A	_____ bu/A	
5. Expected price of crop	\$ _____/bu	\$ _____/bu	
6. Change in value of field loss: (A1 x D3 x D4 x D5)	\$ _____	\$ _____	\$ _____
7. Value of other labor: _____ hr x wage, \$ _____ per hr			\$ _____
8. Total annual cost for custom hire: (D2 + D6 + D7)			\$ _____
E. Custom Hire Income Received			
1. Custom hire charge per acre (income)	\$ _____/A	\$ _____/A	
2. Annual custom hire income: (A2 x E1)	\$ _____	\$ _____	\$ _____
F. Summary			
1. Total annual ownership costs: B12			\$ _____
2. Total annual operating costs: C11			\$ _____
3. Total annual ownership and operating: (F1 + F2)			\$ _____
4. Total custom hire income: E2			\$ _____
5. Net cost for ownership: (F3 - F4)			\$ _____
6. Total custom hire cost: D8			\$ _____
If line F6 is larger than line F5, it is cheaper to own than to custom hire.			
G. Breakeven Acres (optional)			
1. Average custom hire cost per acre: D8 / A1 total			\$ _____
2. Average operating cost per acre: C11 / A3 total			\$ _____
3. Average custom hire income per acre: E2 total / A2 total			\$ _____
4. Added income per acre of custom work done: (G3 - G2)			\$ _____
5. Minimum acres of own crops needed to break even on machine ownership (assumes custom hire income and mix of crops are constant): [F1 - (A2 total x G4)] / (G1 - G2)			_____ A
6. Minimum acres of custom work needed to break even on machine ownership (assumes own acres and mix of crops are constant): [(A1 total x G2) + F1 - F6] / G4			_____ A

Worksheet for Comparing Ownership and Custom Hiring - Harvesting Example

	<u> Corn </u>	<u>Soybeans and Small Grain</u>	<u> Total </u>
A. Annual Use			
1. Acres harvested or sprayed annually, own crops	500 A	500 A	1,000 A
2. Acres harvested or sprayed annually for others	200 A	200 A	400 A
3. Total acres: (A1 + A2)	700 A	700 A	1,400 A
4. Acres per hour (see Table 1, or use own estimate):	5.0 A/hr	5.2 A/hr	
5. Total annual hours of use: (A3 / A4)	140 hr	135 hr	275 hr
6. Fuel used per acre (see Table 2, or use own estimate):	1.45 gal/A	1.00 gal/A	
7. Annual fuel use: (A3 x A6)	1,015 gal	700 gal	1,715 gal
B. Ownership Costs			
1. Total purchase cost of machine and harvesting heads, including value of items traded			\$ 240,000
2. New list price of comparable machine and heads			\$ 265,000
3. Age of machine at purchase (zero if purchased new)			0 yr
4. Expected number of years machine will be owned			10 yr
5. Age of machine at end of ownership period: (B3 + B4)			10 yr
6. Expected salvage value after (B5) <u>10</u> years: Table 3 factor <u>23</u> % x B2			\$ 60,950
7. Total depreciation: (B1 – B6)			\$ 179,050
8. Interest rate <u>6</u> % (average of loan rate and equity rate) minus inflation rate <u>2</u> %			4 %
9. Capital recovery factor (Table 4) for interest rate (B8) and years (B4)			.123
10. Annual capital recovery charge (depreciation, interest): (B6 x B8) + (B7 x B9)			\$ 24,461
11. Annual charge for insurance and housing: 1% x B1			\$ 2,400
12. Total annual ownership cost: (B10 + B11)			\$ 26,861
C. Operating Costs			
1. Annual fuel cost: A7 x fuel price, \$ <u>3.25</u> per gal			\$ 5,574
2. Annual lubrication cost: C1 x .15			\$ 836
3. Accumulated hours of use on machine when purchased (zero if new)			0 hr
4. Repair cost % from Table 5 for the hours from C3			0 %
5. Estimated hours of accumulated use at end of ownership period: (A5 x B4) + C3			2,750 hr
6. Repair cost % from Table 5 for the hours from C5			21 %
7. Net repair cost %: (C6 – C4)			21 %
8. Annual repair costs: (B2 x C7) / B4, or use own estimate			\$ 5,565
9. Labor value: A5 x 1.2 x wage, \$ <u>15</u> per hr			\$ 4,950
10. Value of other labor: <u>200</u> hr x wage, \$ <u>15</u> per hr			\$ 3,000
11. Total annual operating costs: (C1 + C2 + C8 + C9 + C10)			\$ 19,925

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Worksheet for Comparing Ownership and Custom Hiring - Harvesting Example (continued)

	<u>Corn</u>	<u>Soybeans and Small Grain</u>	<u>Total</u>
D. Custom Hire Costs			
1. Custom charge per acre (cost)	\$ <u>37</u> /A	\$ <u>35</u> /A	
2. Custom hire charge per year: (A1 x D1)	\$ <u>18,500</u>	\$ <u>17,500</u>	\$ <u>36,000</u>
3. Extra (+) or reduced (-) field loss from custom hire: (skip to D7 if none expected)	<u>0</u> %	<u>0</u> %	
4. Expected yield	<u> </u> bu/A	<u> </u> bu/A	
5. Expected price of crop	\$ <u> </u> /bu	\$ <u> </u> /bu	
6. Change in value of field loss: (A1 x D3 x D4 x D5)	\$ <u>0</u>	\$ <u>0</u>	\$ <u>0</u>
7. Value of other labor: <u>200</u> hr x wage, \$ <u>15</u> per hr			\$ <u>3,000</u>
8. Total annual cost for custom hire: (D2 + D6 + D7)			\$ <u>39,000</u>
E. Custom Hire Income Received			
1. Custom hire charge per acre (income)	\$ <u>37</u> /A	\$ <u>35</u> /A	
2. Annual custom hire income: (A2 x E1)	\$ <u>7,400</u>	\$ <u>7,000</u>	\$ <u>14,400</u>
F. Summary			
1. Total annual ownership costs: B12			\$ <u>26,861</u>
2. Total annual operating costs: C11			\$ <u>19,925</u>
3. Total annual ownership and operating: (F1 + F2)			\$ <u>46,786</u>
4. Total custom hire income: E2			\$ <u>14,400</u>
5. Net cost for ownership: (F3 - F4)			\$ <u>32,386</u>
6. Total custom hire cost: D8			\$ <u>39,000</u>
If line F6 is larger than line F5, it is cheaper to own than to custom hire.			
G. Breakeven Acres (optional)			
1. Average custom hire cost per acre: D8 / A1 total			\$ <u>39.00</u>
2. Average operating cost per acre: C11 / A3 total			\$ <u>14.23</u>
3. Average custom hire income per acre: E2 total / A2 total			\$ <u>36.00</u>
4. Added income per acre of custom work done: (G3 - G2)			\$ <u>21.77</u>
5. Minimum acres of own crops needed to break even on machine ownership (assumes custom hire income and mix of crops are constant): [F1 - (A2 total x G4)] / (G1 - G2) [26,861 - (400 x 21.77)] / (39.00 - 14.23)			<u>733</u> A
6. Minimum acres of custom work needed to break even on machine ownership (assumes own acres and mix of crops are constant): [(A1 total x G2) + F1 - F6] / G4 [(1,000 x 14.23) + 26,861 - 39,000] / 21.77			<u>96</u> A