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Grain Harvesting Equipment and Labor in Iowa

Iowa farmers have hundreds of thousands of dollars invested in equipment for harvesting and hauling corn and soybeans. In February 2016, as a supplement to the annual Iowa Farm Custom Rate Survey carried out by Iowa State University Extension and Outreach, a survey of the types, sizes, and number of equipment items used for harvesting was included. The following information is based on the 145 responses received. The authors are grateful to the farmers and custom operators who participated in the survey. The respondents were not necessarily a representative sample of all Iowa harvesters, so the results may not be indicative of all Iowa farms.

Combines

The combine is the most expensive equipment item and the key to an efficient and successful harvest. Combines were separated into five categories, based on engine horsepower (Tables 1a, 1b). While new combines are no longer available in the smaller horsepower categories, there are still many 15-year and 20-year old combines operating. There was a strong correlation between the size of the combine and its age, confirming that newer purchases are ever-larger and more expensive models.

Table 1a. Combines by size class (averages)

Class	Size (HP)	Number	Percent	Age (years)	Size of Holding Bin (bu.)	Horse-power	Engine Hours in 2015	Engine Hours, Cumulative
Class 5	125 to 265	34	29%	21	197	210	164	3,475
Class 6	280 to 330	20	17%	9	257	299	258	2,015
Class 7	340 to 380	25	21%	5	298	362	251	1,004
Class 8	400 to 460	26	22%	3	305	428	343	815
Class 9	Over 500	13	11%	5	396	544	309	739
All		**118**	**100%**	**10**	**274**	**342**	**251**	**1,850**

Table 1b. Combines by size class (continued)

Class	Repair Costs in 2015	Repair Cost per Engine Hour in 2015	Repair Cost per Acre in 2015	Acres Harvested in 2015	Corn Acres Harvested per Field Hour*	Soybean Acres Harvested per Field Hour*
Class 5	$ 3,294	$ 20.94	$ 7.49	541	3.4	5.2
Class 6	$ 6,003	$ 32.66	$ 4.62	1,442	9.5	11.8
Class 7	$ 7,420	$ 29.92	$ 3.93	2,287	8.7	12.4
Class 8	$ 6,668	$ 23.83	$ 2.22	2,823	11.0	18.8
Class 9	$ 10,996	$ 37.56	$ 2.74	3,010	15.3	17.7
All	**$ 6,198**	**$ 27.45**	**$ 4.84**	**1,881**	**8.7**	**12.1**

**Field hours are assumed to be 75 percent of engine hours.*

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The larger, newer combines tended to be used for more hours during the harvesting season and, naturally, covered more acres (Table 1b). Machines in the over 500 horsepower class harvested an average of over 3,000 acres in 2015. The average dollars spent on repair costs per acre, including the value of the operator's time spent on maintenance, decreased dramatically with combine size in 2015. This probably can be attributed to the larger models being newer.

The average number of acres harvested per field hour was calculated by dividing the total acres of each crop harvested by the field hours the combine was used (Tables 2,3). Field hours were assumed to equal 75 percent of the engine hours reported.

Most of the corn harvesting heads were of the 6-row, 8-row or 12-row variety. The size of the soybean harvesting heads was more variable, with the largest percentage falling into the 35-foot wide category.

Grain Carts

Grain carts have become increasingly popular. They speed up harvesting by allowing the combine to be unloaded without stopping. Over 80 percent of the survey respondents owned at least one grain cart, and 60 percent owned more than one. The capacity of the carts varied from around 400 bushels to over 1,500 bushels. The larger carts tended to be newer, but had higher repair costs (Table 4), exceeding $500 per cart, on average.

Table 2. Corn harvesting heads (averages)

Size	Number	Percent	Engine Hours in 2015, Corn	Corn Acres Harvested in 2015	Corn Acres Harvested per Field Hour*
6-row	28	27%	131	452	3.2
8-row	43	42%	113	1,279	9.6
12-row	31	30%	184	1,555	12.1
All	**102**	**100%**	**142**	**1,131**	**6.4**

**Field hours are assumed to be 75 percent of engine hours.*

Table 3. Soybean harvesting heads (averages)

Size	Number	Percent	Engine Hours in 2015, Soybeans	Soybean Acres Harvested in 2015	Soybean Acres Harvested per Field Hour*
20 foot	11	12%	105	375	4.9
25 foot	10	11%	99	638	7.6
30 foot	21	22%	65	674	12.0
35 foot	28	30%	86	787	11.2
40 foot	24	25%	94	1,009	16.9
All	**94**	**100%**	**89**	**771**	**11.5**

**Field hours are assumed to be 75 percent of engine hours.*

Table 4. Grain carts (averages)

Size	Number	Percent	Capacity (bushels)	Age (years)	Repair Costs per Cart in 2015
400-650 bu.	32	26%	550	15	$ 407
700-875 bu.	36	30%	783	7	$ 181
1000-1200 bu.	37	31%	1,081	6	$ 405
1250-1500 bu.	16	13%	1,313	3	$ 532
All	**121**	**100%**	**883**	**8**	**$ 358**

Grain Wagons

Survey respondents owned an average of 2.5 grain wagons each (Table 5). The average age of all the wagons was 15 years, with the smaller wagons being the oldest. Repair costs, including tires, were modest, averaging only $65 per wagon in 2015.

Grain Trucks

More and more grain is being hauled in trucks rather than wagons, sometimes for long distances. Trucks were divided into straight trucks and semi-trailer trucks. Eighty percent of the trucks reported were semi-trailer trucks, and they had an average of over half a million miles on their odometers. However, the average number of miles they were driven in 2015 was only about 11,000, which indicates that many of them may have been used as over the road vehicles by their original owners. The semis had an average capacity of nearly 1,000 bushels compared to 547 bushels for the straight trucks (Table 6). Many grain trucks have had considerable years of service. The average age for the straight trucks was 29 years compared to 15 years for the semis. Truck owners spent an average of $3,098 per truck on repairs in 2015. Repair costs per mile were lower for semi-trailer trucks than for straight trucks, averaging $.52 per mile versus $.63 per mile.

Labor

The final section of the survey dealt with the number of people involved in harvesting, transporting, drying, and storing grain. Just over three full-time people and another 2.6 part-time people were engaged in harvesting, on average (Table 7). Assuming that the part-time people worked half-time, on average, a total of 4.4 full-time labor equivalents (FTEs) were used per harvesting operation. When the total number of acres harvested was considered, the average number of FTEs per 1,000 acres was 3.2.

Trends

A similar survey of grain harvesting labor and machinery was done in 2006. Some interesting

Table 5. Grain wagons (averages)

Capacity	Number	Percent	Number per Farm	Age (years)	Repair Costs per Wagon 2015
200 to 350 bu.	65	25%	2.4	24	$ 31
400 to 550 bu.	91	34%	2.6	15	$ 97
600 bu. or more	108	41%	2.6	8	$ 60
All	**264**	**100%**	**2.5**	**15**	**$ 65**

Table 6. Grain trucks (averages)

Type	Number	Percent	Capacity (bushels)	Age (years)	Odometer Miles, End of 2015	Miles Driven in 2015	Repair Costs per Truck in 2015	Repair Costs per Mile in 2015
Straight trucks	28	18%	547	29	285,527	3,821	$ 1,978	$ 0.63
Semi-trailer trucks	127	82%	993	15	569,554	11,335	$ 3,359	$ 0.52
All	**155**	**100%**	**892**	**17**	**513,496**	**10,205**	**$ 3,098**	**$ 0.54**

Table 7. Labor (average number of people per farm)

Activity	Full-time People	Part-time People	Total People	Full-time Equivalents*	FTEs Per 1000 Acres Harvested*
Operating combines	1.2	0.4	1.6	1.3	1.1
Driving trucks	0.9	0.8	1.7	1.3	0.9
Pulling wagons or carts	0.7	1.1	1.8	1.3	1.0
Unloading and drying grain	0.3	0.3	0.6	0.5	0.2
All	**3.1**	**2.6**	**5.7**	**4.4**	**3.2**

**Each part-time person is counted as 0.5 FTE.*

changes have taken place over the past decade, which are summarized in Table 8.

Combines have become much larger. The average horsepower for the combines reported increased from 230 to 342 between 2006 and 2015. Likewise, the area harvested per combine rose from 1,417 acres to 1,881 acres. Repair costs per acre increased by over 50 percent, from $3.33 to $5.24.

Grain carts also increased in size. Their average capacity was 689 bushels in 2006 compared to 883 bushels in 2015. Their average repairs costs also increased, by 50 percent. Semi-trailer trucks became more common, accounting for 82 percent of all grain trucks reported in 2015 versus only 62 percent in the 2006 survey. The average number of miles driven per year for each truck increased from under 8,000 to over 10,000. Repair costs per mile also increased by about 50 percent, from $.37 to $.54.

While machinery sizes and repair costs have uniformly increased during the past nine years, average custom rates have nearly kept pace. Table 9 shows some of the average charges reported in the Iowa Farm Custom Rate surveys carried out in 2006 and 2015.

Summary

Harvesting grain is a complex operation involving multiple workers and units of equipment. Today's managers are challenged to find the proper set of resources that will allow for efficient and timely collection, transportation, and storage of the crop at a reasonable cost.

Table 8. Comparison of grain harvesting machinery in 2006 and 2015

	2006 Survey	2015 Survey
Combine horsepower	230	342
Size of combine holding bin	209	274
Total acres harvested per combine in survey year	1,417	1,881
Engine hours in survey year	285	251
Combine repair costs per acre	$3.33	$5.24
Grain cart capacity	689 bu.	883 bu.
Grain cart repair costs per cart	$236	$358
Percent of grain trucks that were semi-trailers	62%	82%
Miles driven per truck in survey year	7,877	10,205
Grain truck repair costs per mile	$.37	$.54

Table 9. Average farm custom rates in 2006 and 2015

Operation	Average Custom Rate in 2006	Average Custom Rate in 2015
Combining corn, $ per acre	$25.70	$35.35
Combining soybeans, $ per acre	$25.00	$34.75
Hauling grain to storage by wagon, $ per bu.	$.058	$.077
Hauling grain by truck, 25 miles, $ per bu. per mile	$.12	$.18
Hauling corn by grain cart, $ per acre	$5.60	$6.95
Harvesting labor, $ per hour	$10.10	$16.40

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