Machinery Ownership and Leasing

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MAST Program
www.agmanager.info

Purpose of module

- Develop an understanding of the costs associated with owning and operating machinery
- Trying to reduce decisions to numbers
  - Custom hire
  - Own vs. rent
  - Lease vs. purchase
  - Trading strategies
- … targeting the decision tools:
  - *OwnBaler.xls*
  - *OwnCombine.xls*
  - *OwnSprayer.xls*
  - *OwnTractor.xls*
  - *KSU-MachCost.xls*
  - *KSU-GPSguidance.xls*

Module:
Machinery Ownership and Leasing

Session: Benchmarking machinery costs

Recorded fall of 2008

Cost benchmarking is an important task when targeting improvement

Internal benchmarking

vs.

External benchmarking

2007 Harvest Year Report for USCHI's Custom Harvester Analysis and Management Program (CHAMP)

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U.S. Custom Harvesters Inc. AgAnalysis+ AGCO

Custom Harvester Analysis and Management Program (CHAMP)
2007 Harvest Year
Individual Firm Report

Happy Harvesters Inc.
Box 999
Wheat Country, KS 99999

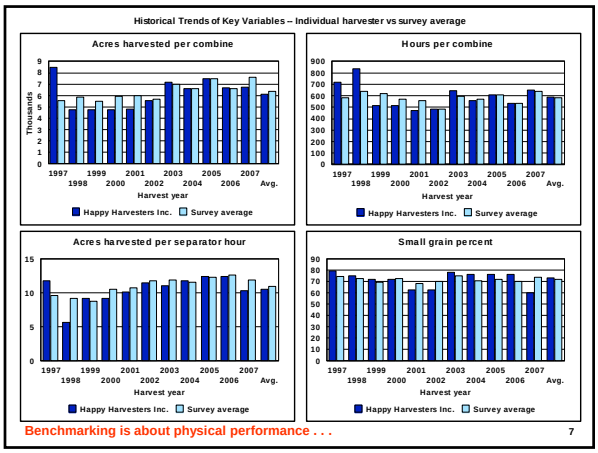
	Firm Value	Survey Average Value	Firm Value per Combine	Survey Avg. of Value per Combine	Firm Value per per Acre	Survey Avg. of Value per per Acre	Firm Value per per Hour	Survey Avg. of Value per per Hour
Number of Machines Operated	4.0	5.49	-----	-----	-----	-----	-----	-----
Value of Combines	$639,000	$863,936	$159,750	$152,803	$23.67	$20.56	$245.77	$244.81
Value of Platforms	$201,000	$254,602	$50,250	$47,541	$7.44	$6.34	$77.31	$75.71
Value of Other Equipment	$551,000	$555,727	$137,750	$114,117	$20.41	$15.26	$211.92	$162.69
Value of Other Assets	$12,000	$55,154	$3,000	$9,037	$0.44	$1.41	$4.62	$16.24
Total Assets	$1,403,000	$1,729,419	$350,750	$323,498	$51.96	$43.57	$539.62	$519.45
Total Acres Covered	27,000	41,371	6,750	7,595	1.0	1.0	10.38	11.92
Combine Rent Acres	N/A	5,550	N/A	216	N/A	0.030	Combine Efficiency	
Small Grains Percent	60.0	74.3	-----	-----	-----	-----	sep.hrs/engine hrs	
Total Separator Hours in 2007	2,600	3,455	650	639	0.096	0.085	75.6%	75.3%

U.S. Custom Harvesters Inc.

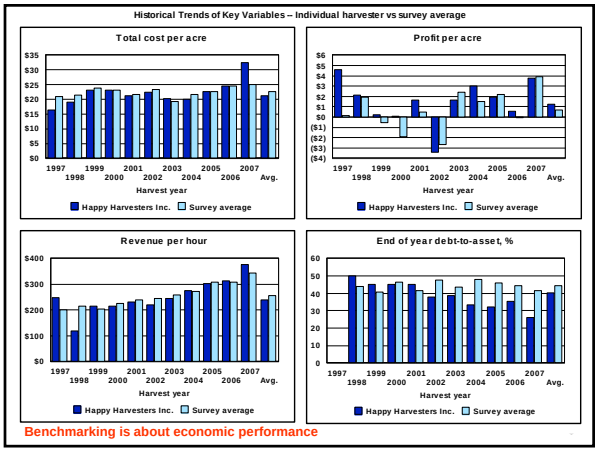
									% of Total Revenue	
									Firm	Survey Avg.
INCOME AND EXPENSE										
Harvest Revenue	$970,000	$1,047,263	$242,500	$	$35.93	$28.27	$373.08	$336.67	99.0%	97.9%
Combine Rent Revenue	N/A	$55,396	N/A	$	N/A	$0.31	N/A	$3.75	0.0%	1.1%
Other Revenue	$9,900	$15,784	$2,475	$	$0.37	$0.31	$3.81	$3.32	1.0%	1.1%
Total Revenue	$979,900	$1,118,443	$244,975	$	$36.29	$28.89	$376.88	$343.74	100.0%	100.0%
Labor (paid and unpaid)	$167,000	$167,549	$41,750	$	$6.19	$4.55	$64.23	$54.25	17.0%	15.7%
Travel	$29,600	$32,810	$7,400	$7,829	$1.10	$1.08	$11.38	$12.83	3.0%	3.8%
Fuel and Lubrication	$194,100	$195,916	$48,525	$40,975	$7.19	$5.31	$74.65	$63.06	19.8%	18.4%
Repair and Maintenance	$114,000	$101,572	$28,500	$21,154	$4.22	$2.75	$43.85	$32.55	11.6%	9.5%
Insurance	$38,000	$38,124	$9,500	$8,496	$1.41	$1.13	$14.62	$13.62	3.9%	3.9%
Telephone and Utilities	$11,500	$8,498	$2,875	$1,828	$0.43	$0.24	$4.42	$2.82	1.2%	0.8%
Machinery hire/lease	$24,500	$42,680	$6,125	$8,129	$0.91	$0.96	$9.42	$11.47	2.5%	3.3%
Other Expenses	$42,200	$23,905	$10,550	$5,583	$1.56	$0.69	$16.23	$8.21	4.3%	2.4%
Market Depreciation	$153,000	$215,636	$38,250	$38,891	$5.67	$5.04	$58.85	$61.01	15.6%	17.5%
Interest on Assets (assigned)	$104,399	$133,655	$26,100	$24,841	$3.87	$3.34	$40.15	$39.75	10.7%	11.6%
Total Expense	$878,299	$960,744	$219,575	$192,934	$32.53	$25.09	$337.81	$299.57	89.6%	86.8%
Total Operating Profit	$101,601	$157,699	$25,400	$30,412	$3.76	$3.80	$39.08	$44.17		
Effective Interest Rate	7.50%	7.44%								
Debt-to-Asset Ratio (end of year)	26.3%	41.4%					Insurance as percent of equipment value =>		2.7%	2.3%
Return on Assets	14.7%	16.6%								
Return on Equity (based on IS)	17.3%	xxx	<===	Operating profit + interest charged on equity divided by beginning of year equity.						
Return on Equity (based on BS)	16.0%	xxx	<===	Change in balance sheet equity divided by the beginning of year equity.						
Expense/$100 Revenue	$89.63	$87.86								

AgAnalysis+

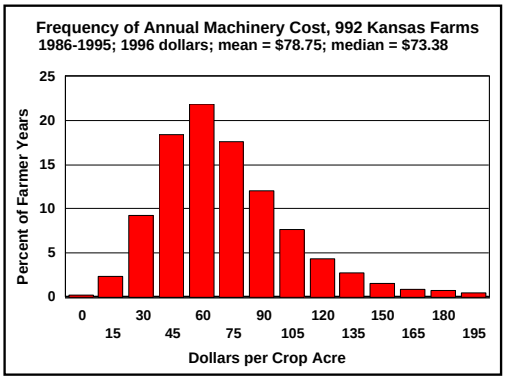
Note: Some reported values were modified from those reported on the survey due to arithmetic and other data entry errors.



Benchmarking is about physical performance . . .



Benchmarking is about economic performance



Machinery costs are highly variable across farms

Machinery costs are highly variable across farms …

Kansas Farm Management Association Enterprise Analysis
Nonirrigated Crops -- State Averages, 2002-2006

	Corn	Irr Corn	Sorghum	Wheat	Soybean	Alfalfa	
Number of Farms	45	15	85	178	74	34	
Average Acres							Total Ac
High profit farms	458	975	407	743	424	112	3,118
Mid profit farms	342	284	332	775	328	185	2,245
Low profit farms	298	455	246	425	286	107	1,817
Machinery Costs, $/acre							Wtd Avg
High profit farms	$59.28	$73.77	$51.08	$51.54	$54.10	$74.13	$60.73
Mid profit farms	$62.57	$82.49	$60.09	$55.48	$62.84	$79.48	$63.70
Low profit farms	$90.82	$104.98	$73.22	$75.72	$75.98	$109.15	$87.20
High less low, $	**-$31.53**	**-$31.21**	**-$22.14**	**-$24.18**	**-$21.88**	**-$35.02**	**-$26.47**
High less low, %	**-34.7%**	**-29.7%**	**-30.2%**	**-31.9%**	**-28.8%**	**-32.1%**	**-30.4%**

Machinery costs are important in explaining profitability differences across farms …

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High less low, %	**-34.7%**	**-29.7%**	**-30.2%**	**-31.9%**	**-28.8%**	**-32.1%**	**-30.4%**
Differences between high profit farms and low profit farms in …							
Net returns	**$91.30**	**$138.74**	**$81.43**	**$65.74**	**$73.87**	**$133.79**	**$89.55**
Total costs	**-$93.54**	**-$125.79**	**-$50.96**	**-$53.84**	**-$53.15**	**-$65.86**	**-$75.97**
Cost/net returns	**102.5%**	**90.7%**	**62.6%**	**81.9%**	**72.0%**	**49.2%**	**84.8%**
Mach/total costs	**33.7%**	**24.8%**	**43.4%**	**44.9%**	**41.2%**	**53.2%**	**34.8%**
Mach/net returns	**34.5%**	**22.5%**	**27.2%**	**36.8%**	**29.6%**	**26.2%**	**29.6%**

Machinery Costs NW KS Wheat Enterprises

	KFMA 95	Farm A 97
Labor (hired & unpaid)	$17.23	$27.00
Gas/Fuel/Oil	$ 6.03	$ 7.57
Repair & Maintenance	$11.43	$ 9.19
Personal Property Tax	$ 0.53	$ 0.49
General Insurance	$ 1.97	$ 1.89
Utilities	$ 1.69	$ 1.48
Auto Expense	$ 0.72	$ 0.00
Economic Depreciation	$ 8.71	$12.91
Net Machine Hire	$11.93	$ 0.82
Interest (9% assign)	$ 8.97	$11.40
Total	$69.21	$72.75

Machine hire makes it hard to compare

Machinery Costs NW KS Wheat Enterprises

combine tax, insurance, utilities; prorate auto expense and machine hire

	KFMA 95	Farm A 97
Labor (hired & unpaid)	$21.08	$27.31
Gas/Fuel/Oil	$ 7.38	$ 7.66
Repair & Maintenance	$13.99	$ 9.29
Tax, Insurance, Shelter	$ 5.13	$ 3.90
Economic Depreciation	$10.66	$13.06
Interest (9% assign)	$10.97	$11.53
Total	$69.21	$72.75

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Machinery Costs NW KS Wheat Enterprises

using custom rates (1997) approach

	# operations	$/operation
Undercutter (V-Blade)	4	$ 4.68
Offset Disk	1	$ 4.38
NH3 Application	1	$ 6.16
Drill	1	$ 5.61
Harvest 40 bu.	1	$19.87
Total		$54.74

Where's the rest of the costs?

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Research comparing whole-farm costs with custom rates…

- Master's thesis – Aaron Beaton
- Based on KFMA database and cooperator surveys for the year 2001
- Excel spreadsheet (*KSU-MachCost*) that can be used to estimate and benchmark farm specific machinery costs

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Data

- **Field operations performed**
  - **Survey of Kansas Farm Management Association Members**
    - **Collected number of units (acres, tons, miles)**
- **Financial data**
  - **Kansas Farm Management Association database.**
    - **Total Crop Machinery Costs = crop share of machinery repairs, gas-fuel-oil, farm auto expense, motor vehicle depreciation, machinery-equipment depreciation, machine hire expense, opportunity interest on crop machinery investment, machinery shelter costs, machinery insurance cost and crop machinery labor.**
  - **Modified variables**
    - **Depreciation, shelter, insurance, and labor**

Summary Statistics

	Average	Low Quartile[1]	High Quartile[1]
Machinery costs			
Total crop machinery cost/acre (dollars)	$83.29	$53.92	$121.74
Acres			
Harvested acres (acres)	1,188	1,405	982
Machinery cost components			
Machinery labor cost	25.0%	30.8%	24.6%
Insurance	0.9%	0.9%	0.8%
Shelter	1.8%	1.6%	2.0%
Repair	16.4%	15.9%	16.2%
Fuel, gas and oil	10.3%	10.7%	9.6%
Auto	1.0%	1.3%	0.9%
Depreciation	21.7%	14.0%	24.3%
Machine hire expense	10.2%	12.0%	9.5%
Opportunity interest	12.7%	12.8%	12.1%

[1] Quartiles when sorted by Total crop machinery costs per acre.

Expected costs …

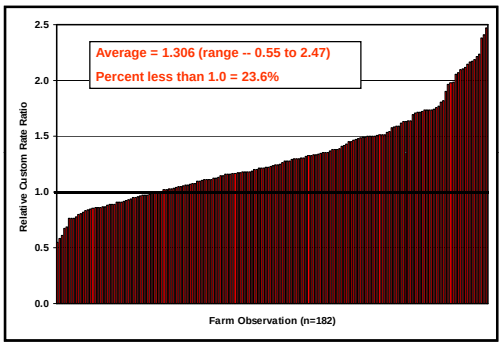
- **Benchmarking means to compare actual costs with what they might be expected to be**
- **Given that KFMA data are whole-farm costs, across farm comparisons are not appropriate. Thus, what costs do we benchmark against?**
- **Where do "expectations" come from?**

Farm costs vs. custom rates

Expected crop machinery cost at custom rates

- Sum of all operations performed on the farm multiplied by their respective custom rates
- Relative custom rate ratio developed
  - If > 1, then per unit costs are greater than custom rates
  - If = 1, then per unit costs are equal to custom rates
  - If < 1, then per unit costs are less than custom rates

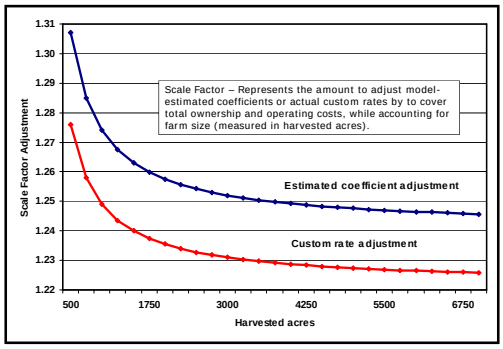
Relative custom rate ratio



Conceptual model

- TCMC = *f* (field operations, farm size)
- Expected value of field operation coefficients are custom rates published by Kansas Agricultural Statistics
- Farm size represents a scale factor to adjust model-estimated coefficients by to account for economies of size

Estimated Scale Factor



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Conclusions

- Published custom rates need to be increased by approximately 25% (for a farm with 1,000 harvested acres)
- Economies of size exist (i.e., scale factor adjustment decreases as farm size increases)
- Procedure developed to find farm-specific, per unit machinery costs
- Results are useful for benchmarking costs and have been incorporated into *KSU-MachCost.xls*

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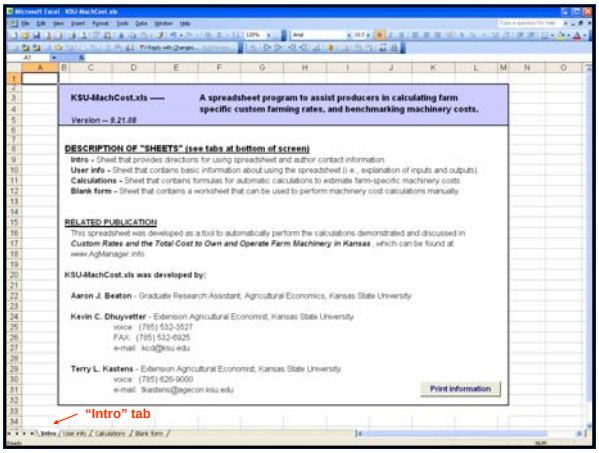
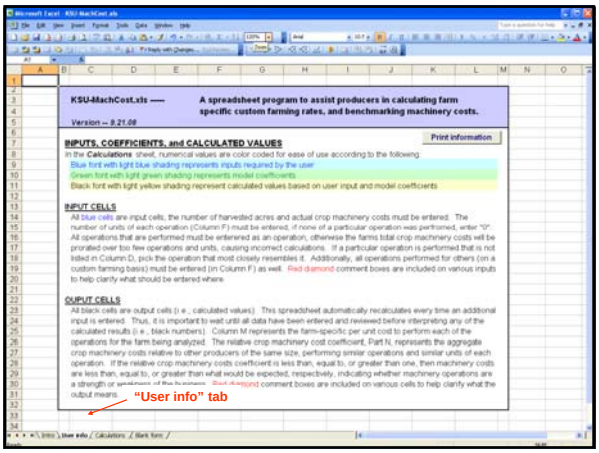
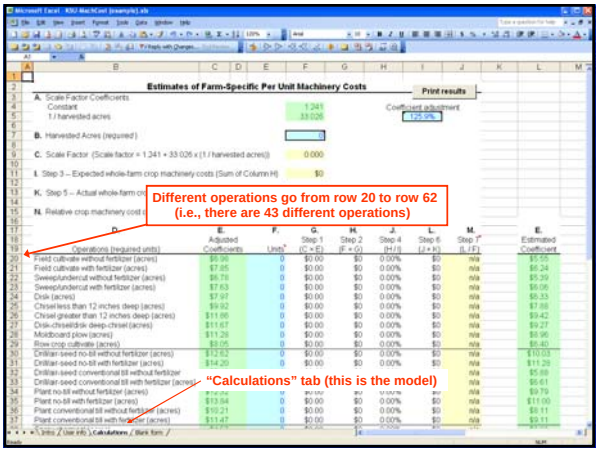
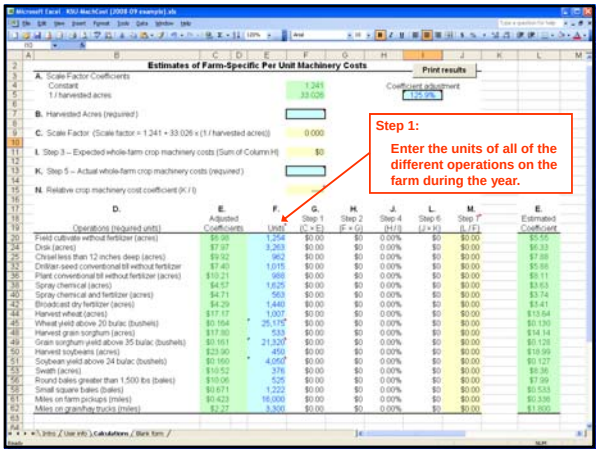
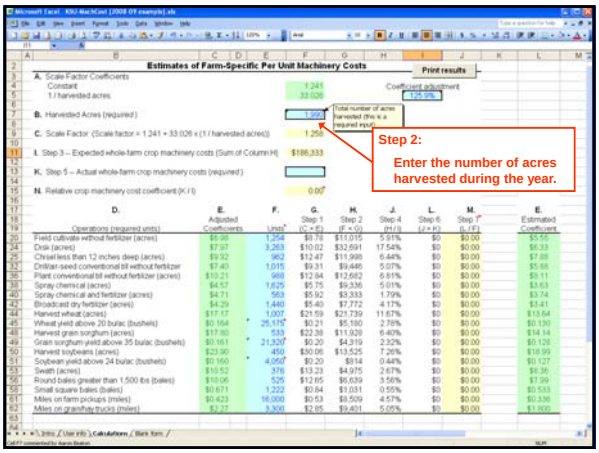
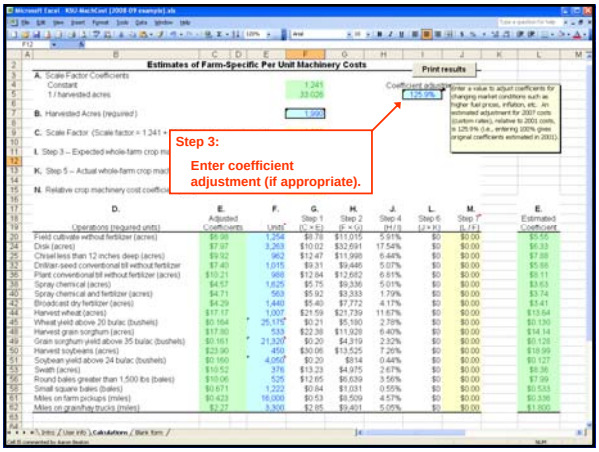


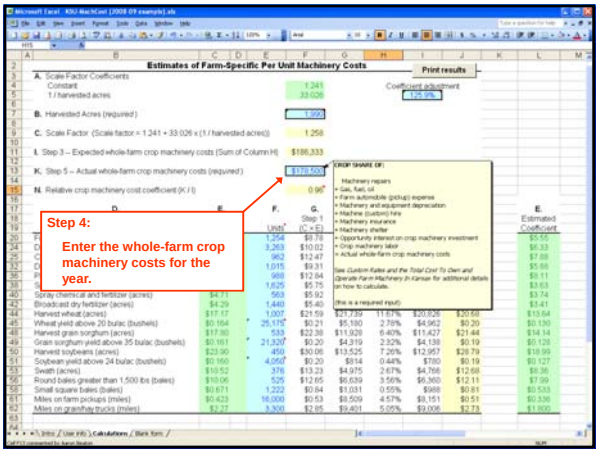

KSU-MachCost.xls ——
A spreadsheet program to assist producers in calculating farm specific custom farming rates, and benchmarking machinery costs.
Version -- 8.21.08
INPUTS, COEFFICIENTS, and CALCULATED VALUES
Print information
In the Calculations sheet, numerical values are color coded for ease of use according to the following:
Blue font with light blue shading represents inputs required by the user
Green font with light green shading represents model coefficients
Black font with light yellow shading represent calculated values based on user input and model coefficients
INPUT CELLS
OUPUT CELLS
"User info" tab


Estimates of Farm-Specific Per Unit Machinery Costs
Print results
Different operations go from row 20 to row 62 (i.e., there are 43 different operations)
"Calculations" tab (this is the model)


Estimates of Farm-Specific Per Unit Machinery Costs
Print results
Step 1:
Enter the units of all of the different operations on the farm during the year.


Estimates of Farm-Specific Per Unit Machinery Costs
Print results
Step 2:
Enter the number of acres harvested during the year.


Estimates of Farm-Specific Per Unit Machinery Costs
Print results
Step 3:
Enter coefficient adjustment (if appropriate).

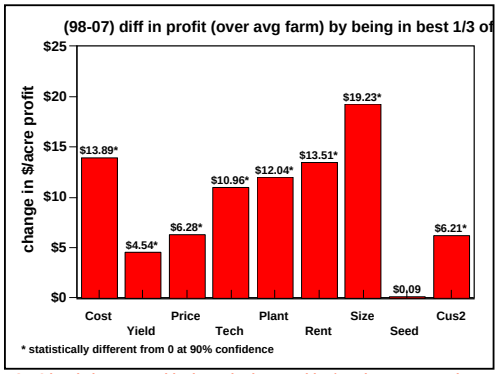

Estimates of Farm-Specific Per Unit Machinery Costs
Print results
Step 4:
Enter the whole-farm crop machinery costs for the year.

For more information see:

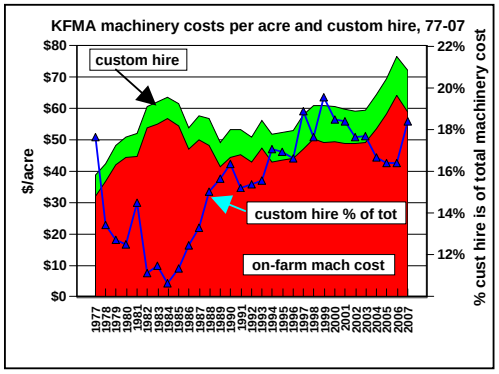
- Extension publication: *Custom Rates and the Total Cost To Own and Operate Farm Machinery In Kansas (MF-2583)*
- Excel spreadsheet: *KSU-MachCost.xls*
- Available at www.AgManager.info
  (Farm Management Machinery Section)

Implications of this research?

- It does appear many farms would be better off hiring farming operations rather than doing them in house
  - Is that really true?
- Are farms using more custom work today?
  - i.e., is the overall demand increasing?
- Are bigger or smaller farms hiring custom work?
  - Where is the best market segment?



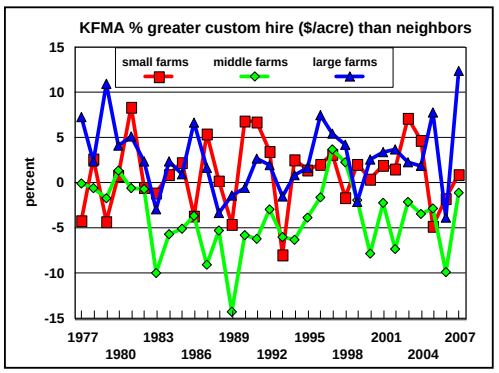
Cus2 is relative custom hire intensity (custom hire / total crop expense).
Custom hire does appear to make one more profitable.



Maybe a slight temporal increase in demand for custom hire . . .

Custom hire versus farm size?

- Some management features have showed trends over time related to big vs. small farmers
- Has that been true regarding custom hire?



Small and large farms tend to spend more $/acre in custom hire than avg size.

Additional thoughts on custom work

- Doug Karre, Frenchman Valley Coop (12/8/04)
  - Customers are small and big farms, not middle
  - Profitable in its own right; related seed and fertilizer sales is an added bonus
- We're wondering. . .
  - History showed custom hire by big and small farms
  - With increasing size-polarization of farms, the big and small will be all that's left – increased demand
- Things to consider:
  - Make custom services profitable in their own right
    - Not just machinery but also agronomic or other services
  - Keep thinking about bi-polarization

Crop Machinery Investment, Kansas, 2007, $/a

2007	as is /cropland	as is /crop	"if don't hire custom work" /cropland	/crop	$custom-to-mkt investment factor
NW	$124	$137	$154	$171	2.1
SW	$96	$149	$127	$198	2.1
NC	$129	$124	$145	$139	2.0
SC	$145	$144	$170	$169	2.8
NE	$177	$176	$205	$204	2.6
SE	$176	$157	$194	$173	2.3
KS	$146	$147	$169	$171	2.2

For benchmarking, multiply the factor times the $/year of custom machine work you hire (NET of what you do for others) to estimate the additional machinery investment you might have if you did the work in house. Don't forget machine hire embedded in bundled charges (e.g., herbicide application).

External benchmarking will become harder over time …

- Some farms do more custom hire
- Some farms rent machines
- Some farms do less tillage
- Some farms raise specialty crops

… external benchmarking may need to be done on broader categories (internal benchmarking will still be important but it is also affected by these factors)

End of Session:

Benchmarking machinery costs