

Investing for Expansion ... Choosing Machinery ... for Growth



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Introduction

- We're not going to talk about sizing machinery for your operation, i.e., nuts and bolts kinds of calculations
- Rather, we're going to discuss underlying forces & principles related to machinery – maybe we'll touch on something you hadn't thought about

Machinery costs are important

Machinery cost categories

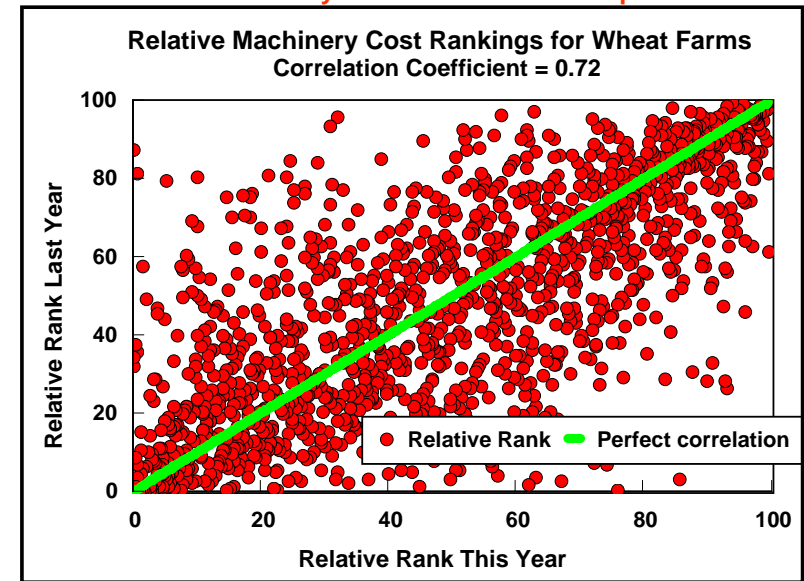
- Repair and maintenance
- Labor
- Depreciation (market, not tax depreciation)
- Interest (opportunity interest)
- Fuel and lubrication
- Taxes, insurance, and shelter
- Custom hire

Machinery costs are especially important!

Kansas Farm Management Association Crop Enterprises Analysis State Averages, 2006-2008						
	Corn	Irr Corn	Sorghum	Wheat	Soybean	Alfalfa
Number of Farms	98	45	132	225	120	49
Average Acres	436	547	340	668	308	71
Costs, \$ per Acre						
Seed	\$36.27	\$54.16	\$13.74	\$10.55	\$30.36	\$9.00
Fertilizer	52.88	80.90	39.62	35.94	7.90	10.01
Herb-Ins	28.15	42.06	28.96	8.59	19.35	11.21
Crop Ins	14.08	20.00	9.07	7.34	10.91	0.50
Machinery	91.03	123.56	77.68	80.06	81.41	106.49
Other	22.99	109.29	20.29	21.34	21.91	24.95
Land	51.93	97.96	36.24	31.84	45.76	54.00
Interest	23.80	38.02	16.78	16.24	17.82	19.91
Total Cost	\$321.12	\$565.95	\$242.39	\$211.89	\$235.41	\$236.06
Machinery, %	28.3%	21.8%	32.0%	37.8%	34.6%	45.1%

Note: A portion of interest cost should also be allocated to machinery costs
Costs reflect operator's costs on owned and rented land

Relative machinery costs are somewhat repeatable



Machinery cost management is more important than traits like marketing

Machinery costs are highly variable across farms ...

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	Corn	Irr Corn	Sorghum	Wheat	Soybean	Alfalfa
Number of Farms	98	45	132	225	120	49
Average Acres						
High profit farms	507	637	371	841	346	63
Mid profit farms	544	520	397	764	369	102
Low profit farms	259	485	252	400	211	136
Machinery Costs, \$/acre						
High profit farms	\$78.94	\$115.99	\$65.12	\$68.02	\$67.40	\$94.62
Mid profit farms	\$82.09	\$116.33	\$73.19	\$71.32	\$79.06	\$96.01
Low profit farms	\$111.78	\$138.34	\$94.73	\$100.84	\$97.76	\$129.50
High less low, \$	-\$32.83	-\$22.35	-\$29.62	-\$32.82	-\$30.36	-\$34.88
High less low, %	-29.4%	-16.2%	-31.3%	-32.5%	-31.1%	-26.9%

Machinery costs are important in explaining profitability differences across farms ...

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Differences between high profit farms and low profit farms in ...						
Net returns	\$149.77	\$251.77	\$125.44	\$119.56	\$129.62	\$166.02
Total costs	-\$88.75	-\$231.10	-\$48.01	-\$79.72	-\$57.41	-\$82.24
Cost/net returns	59.3%	91.8%	38.3%	66.7%	44.3%	49.5%
Mach/total costs	37.0%	9.7%	61.7%	41.2%	52.9%	42.4%
Mach/net returns	21.9%	8.9%	23.6%	27.5%	23.4%	21.0%

Low- vs High-Profit Groups in Illinois
 (Six-year ('95-'00) average return – Source: University of Illinois)

Trait/category	Low-profit group		High-profit group	
Total acres	672		1,007	
Owned	171	(25.4%)	74	(7.3%)
Share rent	311	(46.3%)	789	(78.4%)
Cash rent	190	(28.3%)	144	(14.3%)
Total costs (\$/A)	\$430		\$340	
Land	133	(30.9%)	98	(28.8%)
Power	71	(16.5%)	55	(16.2%)
Buildings	23	(5.3%)	19	(5.6%)
Labor	50	(11.6%)	30	(8.8%)
Variable inputs	99	(23.0%)	92	(27.1%)
Other	54	(12.6%)	46	(13.5%)
Power, bldgs, & labor	144	(33.5%)	104	(30.6%)

Economies of size: a powerful force driving agriculture

**An important driving force in agriculture:
Economies of size**

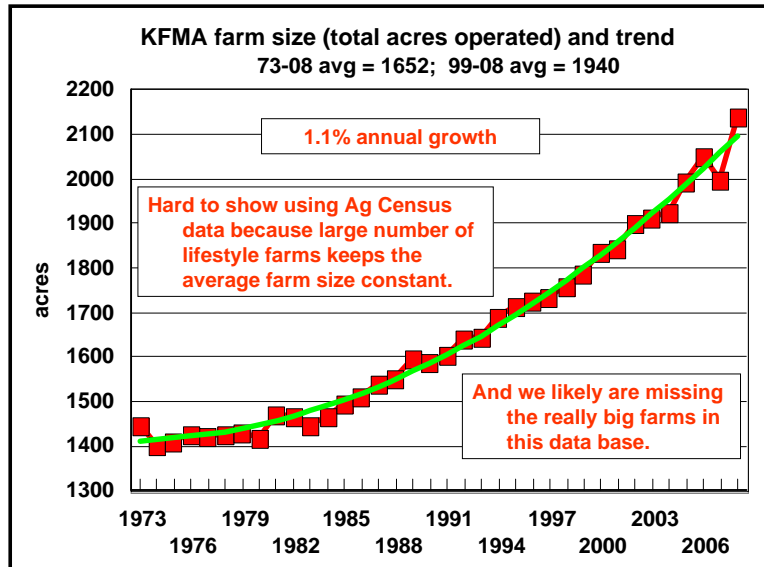
- Per-unit costs fall as a firm gets bigger
 - Essentially about spreading fixed costs
 - Sometimes means higher prices as well

Is EOS for real?

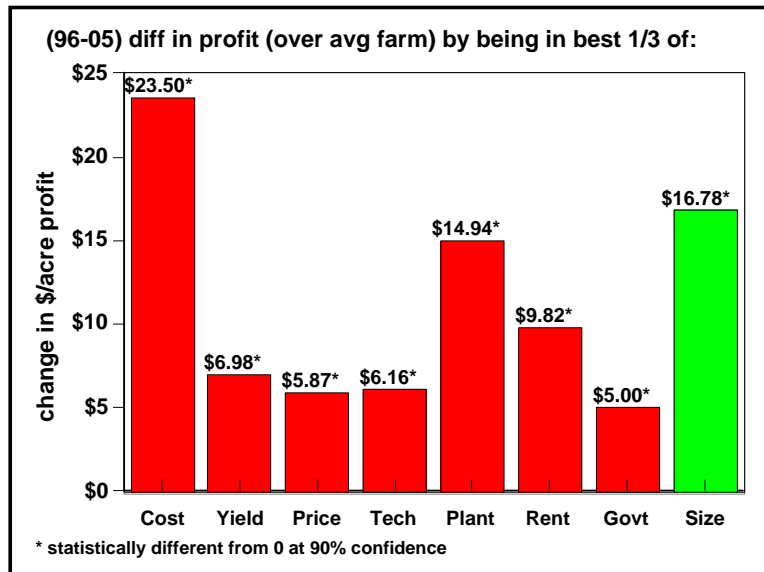
- Is there a benefit to targeting growth and size?
- Or, is growth an accident of good management (plowing profits back into the farm or business)?

Is EOS for real?

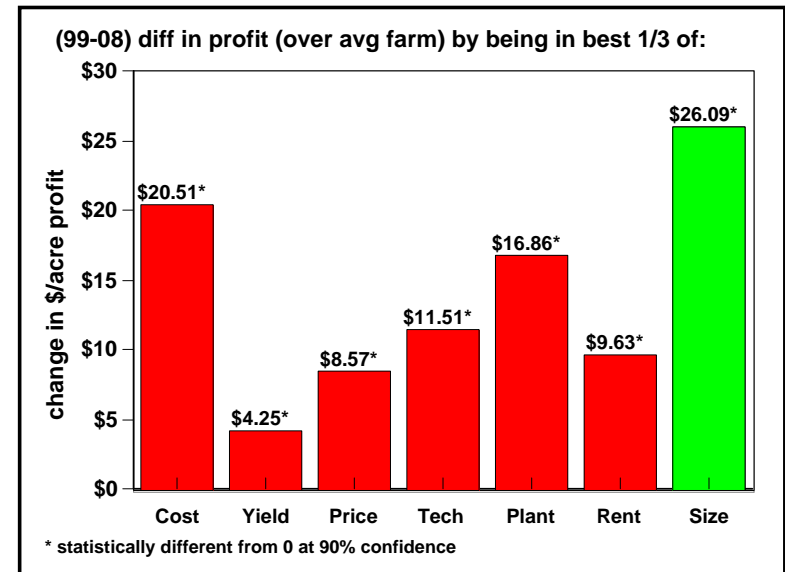
- Hard to distinguish effect of good management and other factors from the effect of size
- Statistical regression is one way to do it
 - After you correct or adjust for the impact of other factors, is there still a positive impact on profit associated with size?



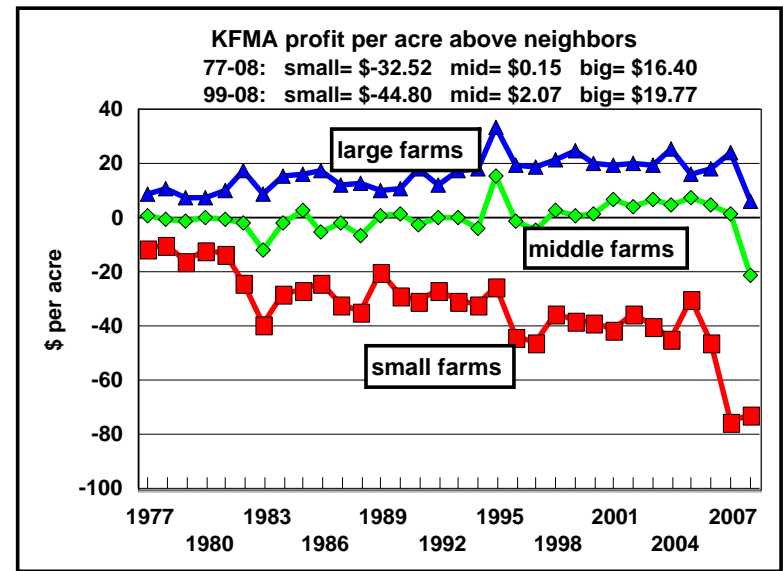
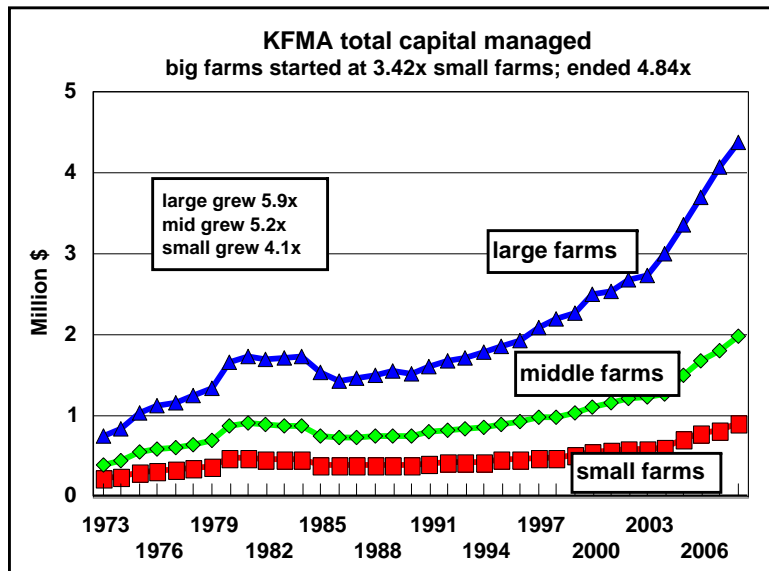
Farm size has been increasing at an increasing rate for COMMERCIAL farms



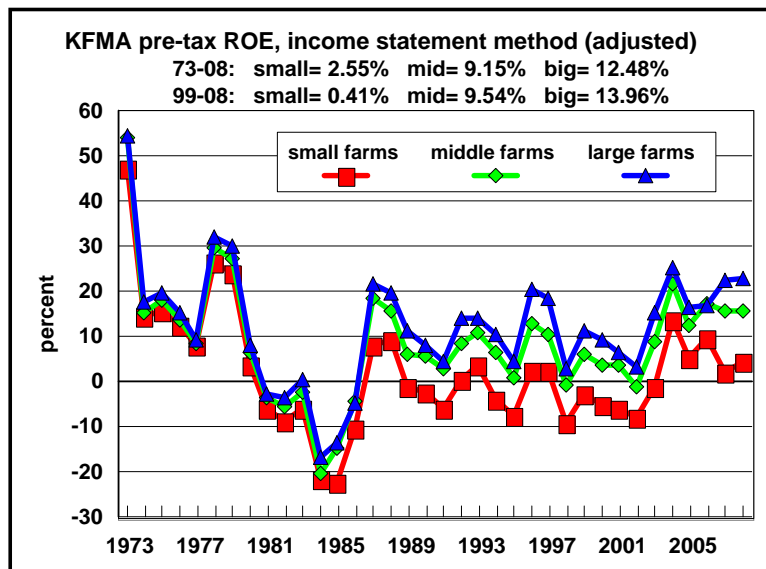
A size effect remains – evidence that EOS is for real. Machinery cost management helps make up the Size bar. And, don't forget that it also is a huge part of the Cost bar!



EOS is becoming more important, absolutely and relatively



The characteristic differences across farm sizes result in profit differences



The characteristic differences across farm sizes result in profit differences

Why are large farms more profitable?

- Lower cost is the obvious benefit, but other benefits arise from the research
- Larger farms:
 - Have much lower costs
 - Get somewhat higher yields
 - Get slightly higher prices
 - Farm more intensively
 - Are much faster adopters of technology, for example, less-tillage

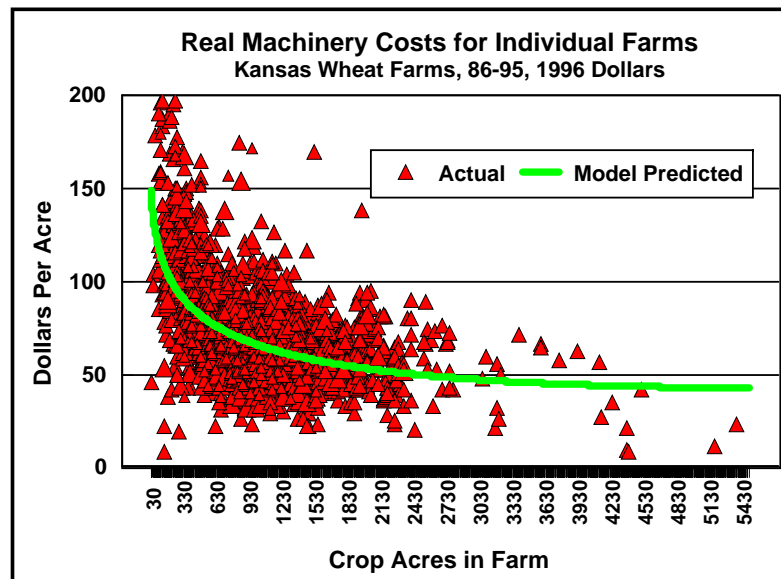


Large farms are not only more profitable

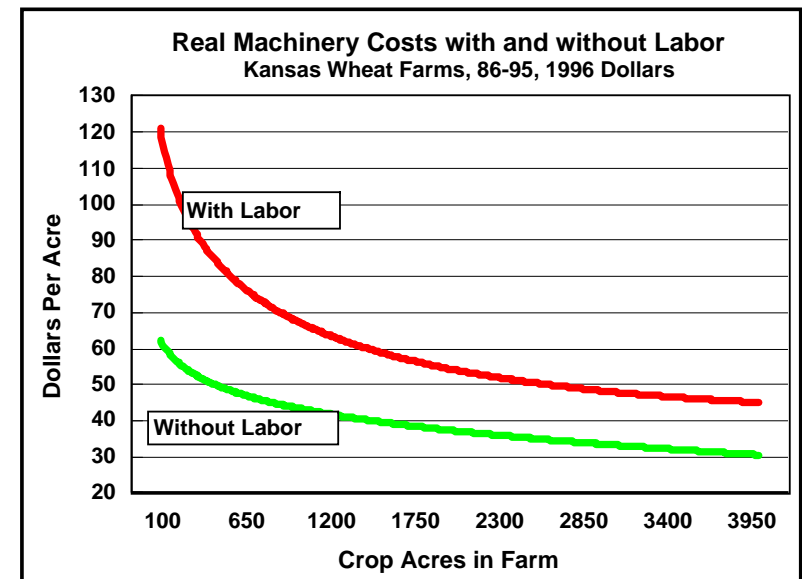
- The disparity between large and smaller farms has been growing over time.
- Will the traditional **one-family** family farm soon be a thing of the past?
 - The family farm will go on but it will be an extended family
- Farming will become increasingly bimodal

Changing EOS features across farm size

- Labor first
 - Labor is fixed and it pays to be fully employed
- Machinery second
 - Bigger machines are less expensive per unit of capacity

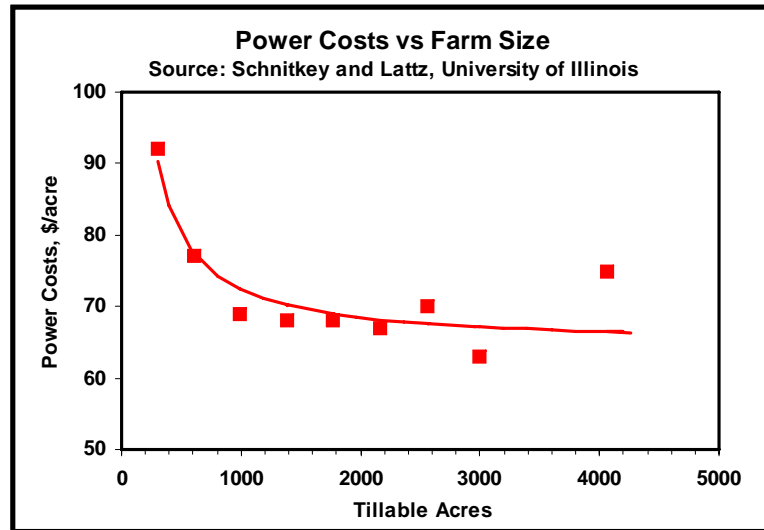


23



24

Machinery cost economies of size ...



25

Changing EOS features across farm size

- Other things third

- Management can be spread over still more acres
 - e.g., marketing, hybrid selection, technology evaluation, assessing FSA or crop insurance opportunities
- Quantity price discounts or premiums
 - Crop sales
 - Machinery and crop input purchases
 - Larger loans mean lower interest rates

Changing EOS features across farm size

- Less direct things fourth

- Large geographical spread
 - Less yield and profit risk
 - Quicker reliable inferences from farm level data
 - More opportunities to rent additional land
- Business image: landlords favor large farms
 - Or is it youth, longevity, profitability, technological advancement, and community viability?

Will consolidation in *crop production* speed up?

- Farm machinery:
 - More like a fixed investment in factory facilities
 - Sophisticated, expensive, for round-the-clock use
- People:
 - Skills required are becoming more specialized
 - often requiring different people (like other businesses), meaning that cost component is more of a fixed cost
 - Business continuity means a management team
 - even larger fixed cost
- Remember, rapid consolidation in poultry, swine, and dairy was not foreseen

We do offer some nuts and bolts (computational) tools . . .

Machinery Decision Tools at www.agmanager.info



OwnCombine.xls



KSU-GPSguidance.xls



OwnBaler.xls



OwnSprayer.xls

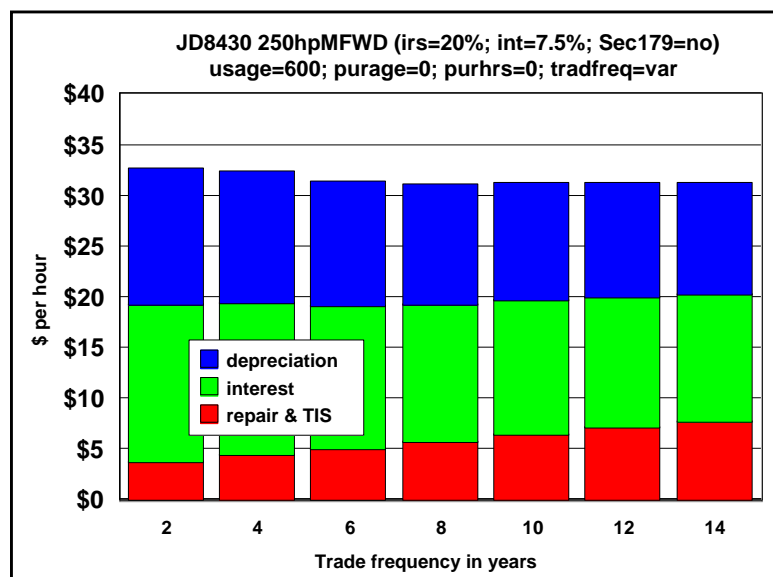


KSU-MachCost.xls

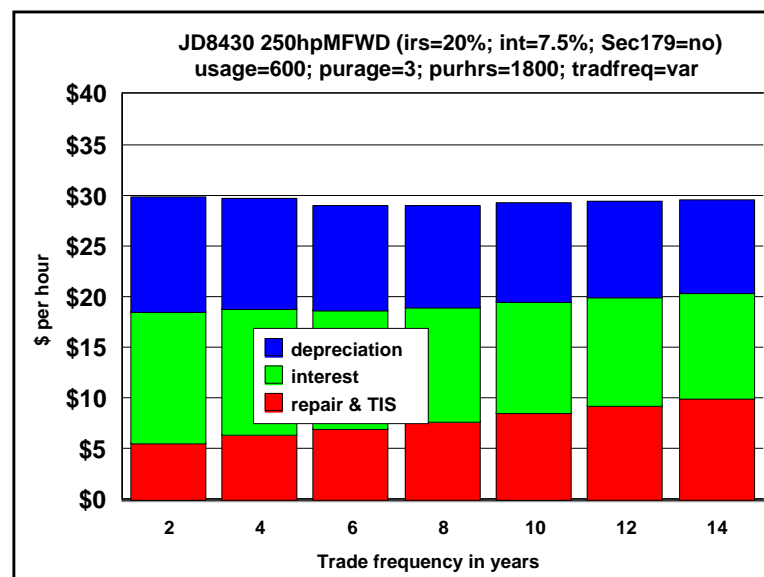


OwnTractor.xls

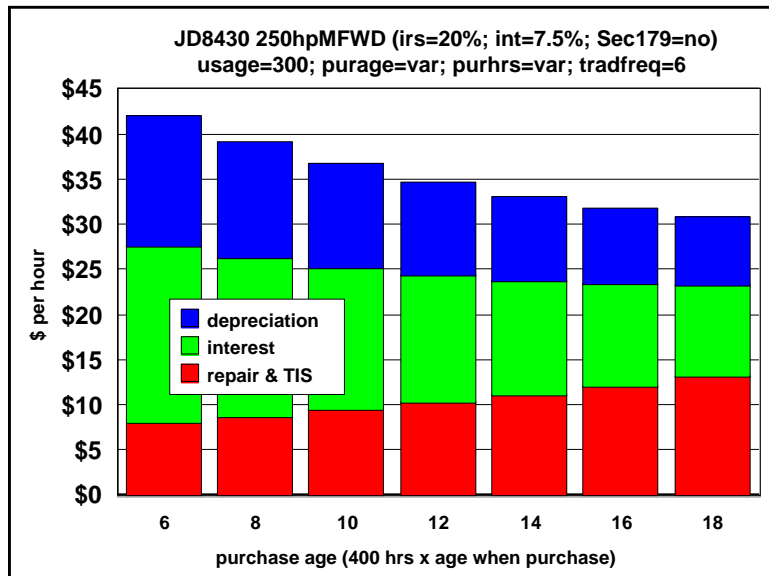
Optimal machinery trading: no universal recommendations



The market is fairly efficient when buy NEW and with a variable holding period

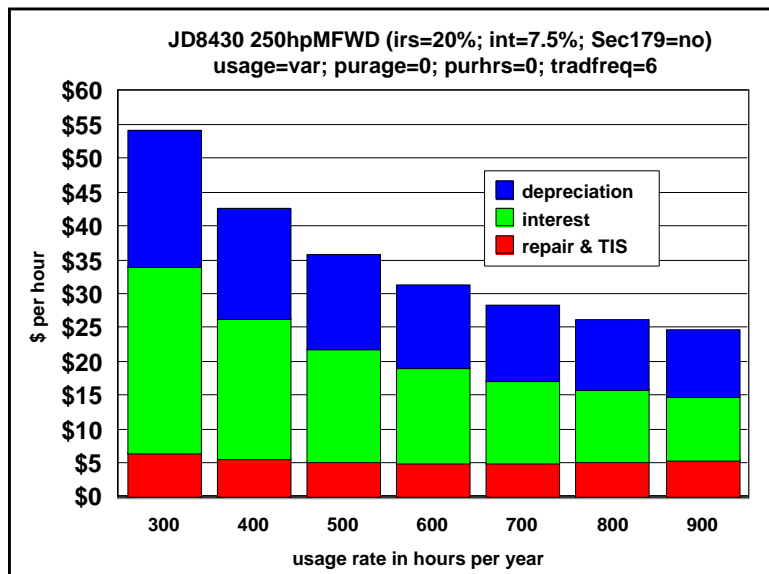


The market is fairly efficient when buy OLD and with a variable holding period



Less intensive users can hold down costs by buying older tractors, but must be able to handle high repairs and do without newer technologies

Hard to beat intensity of use as a cost reducer...



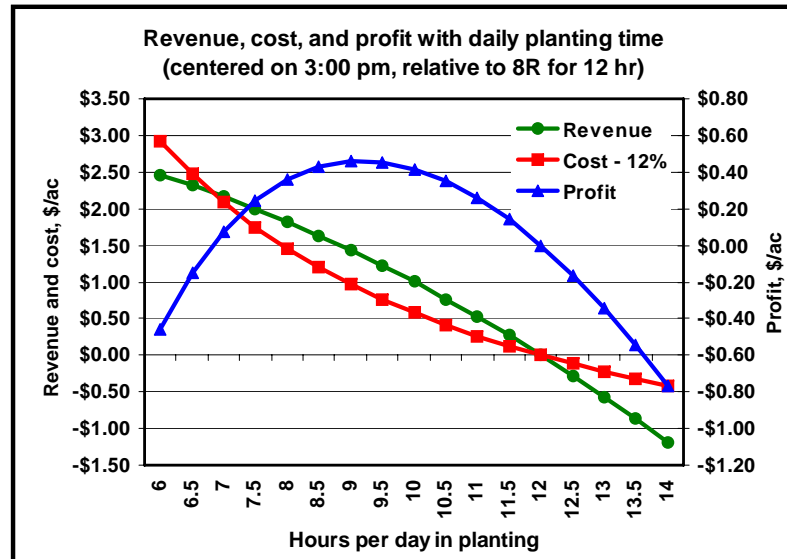
Not a trading strategy, but putting more hours on per year really pays off

Intensity of use considerations

- GPS-based steering and machine control promotes long hours and night-time activity
- Be sure you're ready (machinery good repair)
- Do the agronomics support night work?



Do the agronomics support night-time operations?



Intensity of use considerations

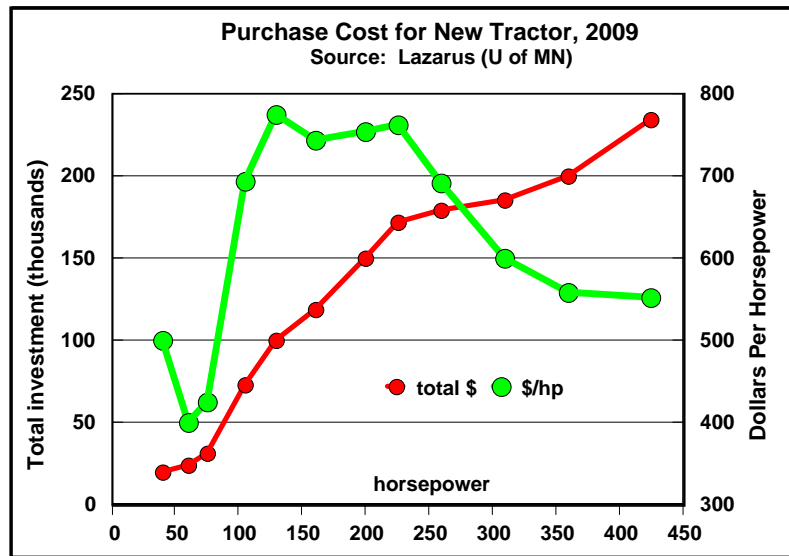
- GPS-based steering and machine control promotes long hours and night-time activity
- Be sure you're ready (machinery good repair)
- Do the agronomics support night work?
- Is night work supported by auxiliary businesses, e.g., elevators, repair shops?
- How safe is night travel with machinery?
- Will employees and family members support night work?
- Think tradeoff between short- and long-run profit.

**Hard to beat machinery size as a cost reducer...
at least historically**

Machinery size issues

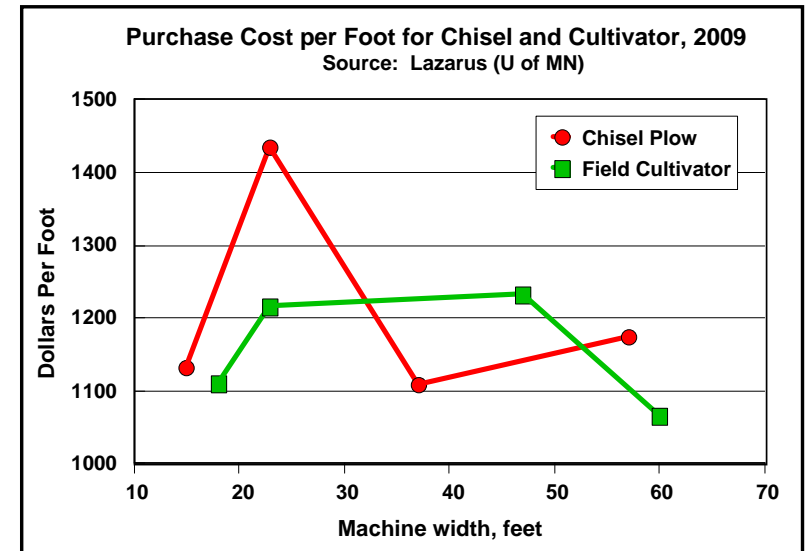
- Large equipment requires major investment
 - investment is not the same as cost
 - ability to use capacity is critical
- *Per acre*, larger machines require
 - similar or a bit lower investment
 - much lower labor costs (the big driver)

Big equipment requires larger investment ...

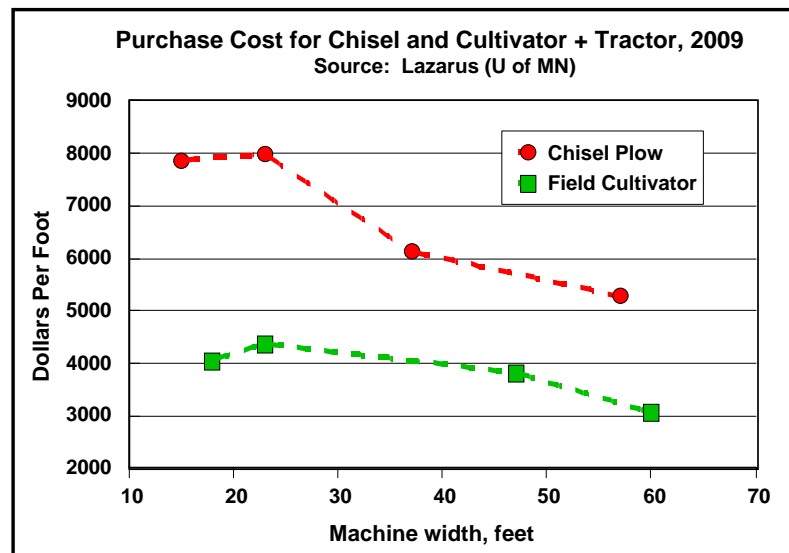


... but investment per hp falls with larger equipment.

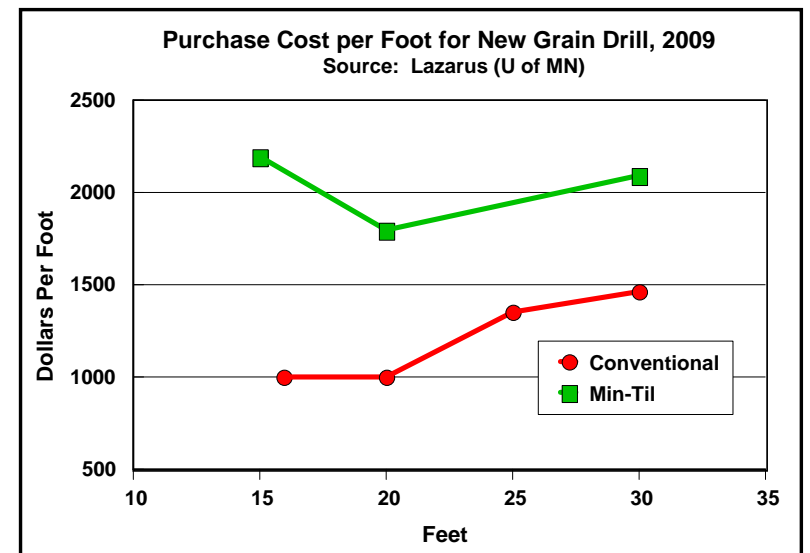
Investment for implements does not necessarily fall with size ...



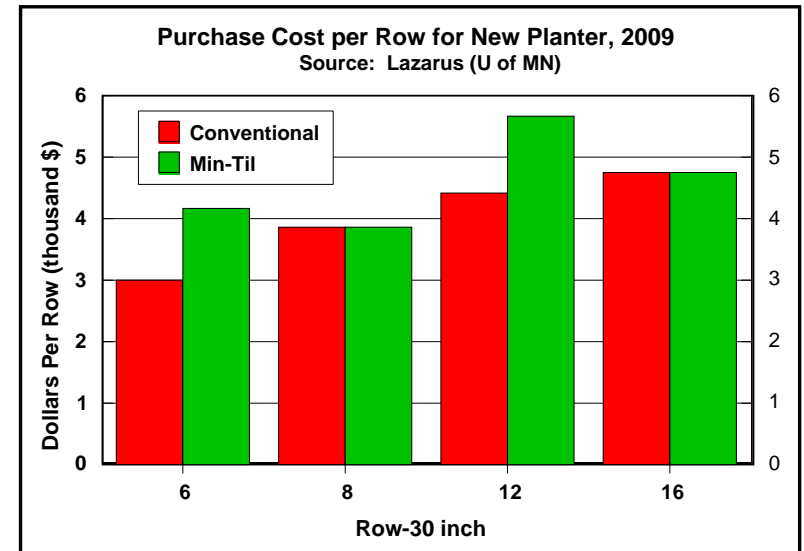
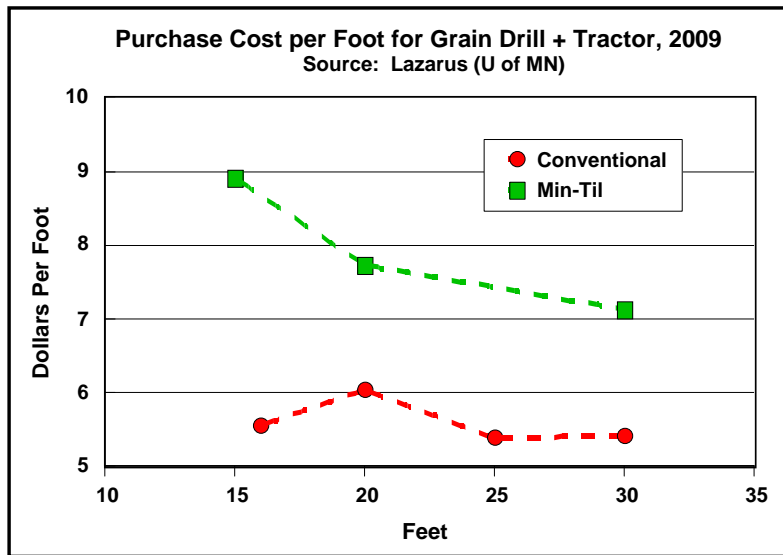
But, when including tractor cost it still might ...



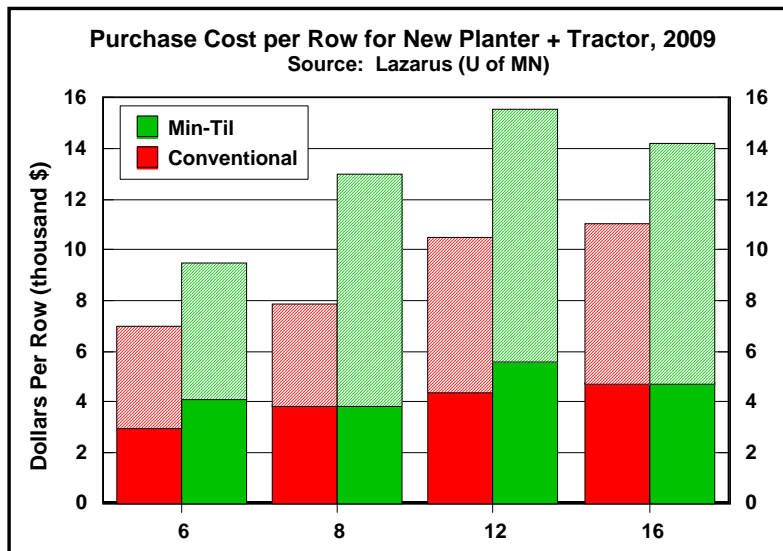
Investment for implements does not necessarily fall with size ...



But, when including tractor cost it still might ...



In some cases, costs might not fall with size (even w/tractor) ...



Solid portion of bars is planter investment, hatched portion is tractor investment

Purchase cost per unit of machinery does not always fall with larger equipment, but other factors also come into play in the machinery size decision...

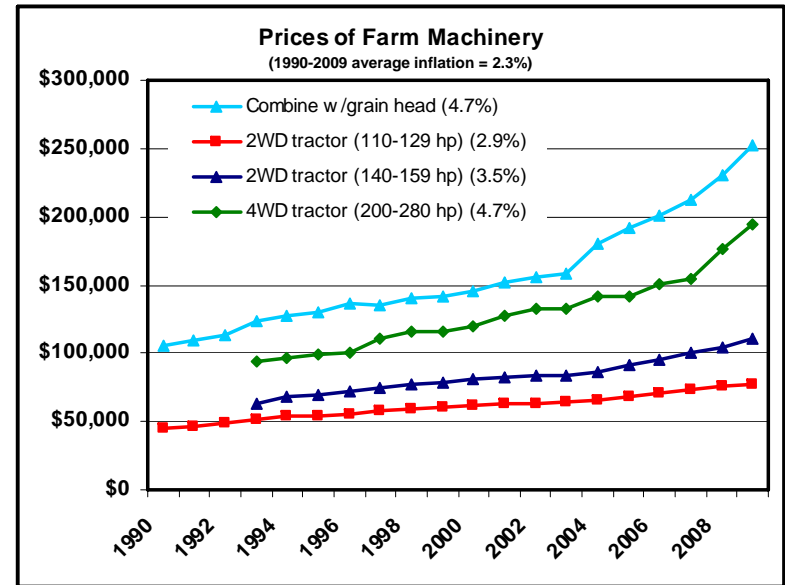


... timeliness needs to be factored in to the decision.

Machinery cost categories

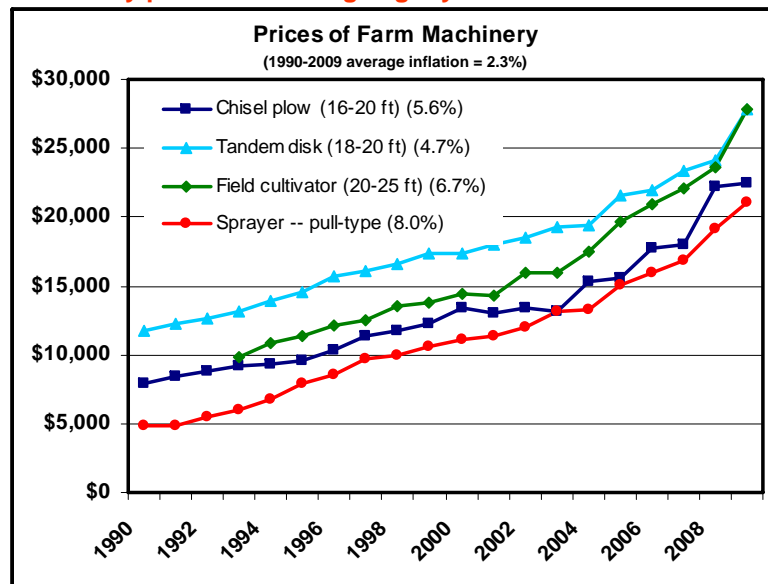
- Repair and maintenance
- Labor
- Depreciation (market, not tax depreciation)
- Interest (opportunity interest)
- Fuel and lubrication
- Taxes insurance and shelter
- Custom hire
 - Leads to published and “accepted” custom rates
 - Proxy for how costs are changing over time?

Machinery prices increasing slightly more than inflation...



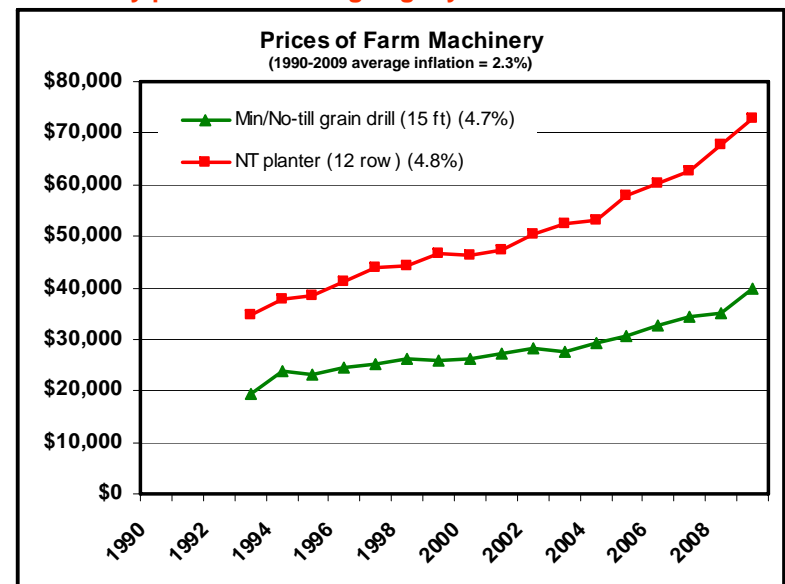
Source: USDA Agricultural Prices

Machinery prices increasing slightly more than inflation...



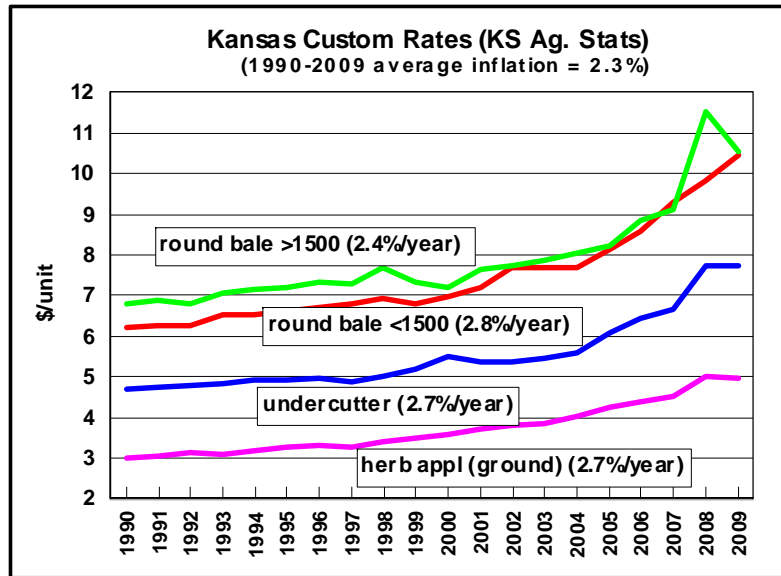
Source: USDA Agricultural Prices

Machinery prices increasing slightly more than inflation...



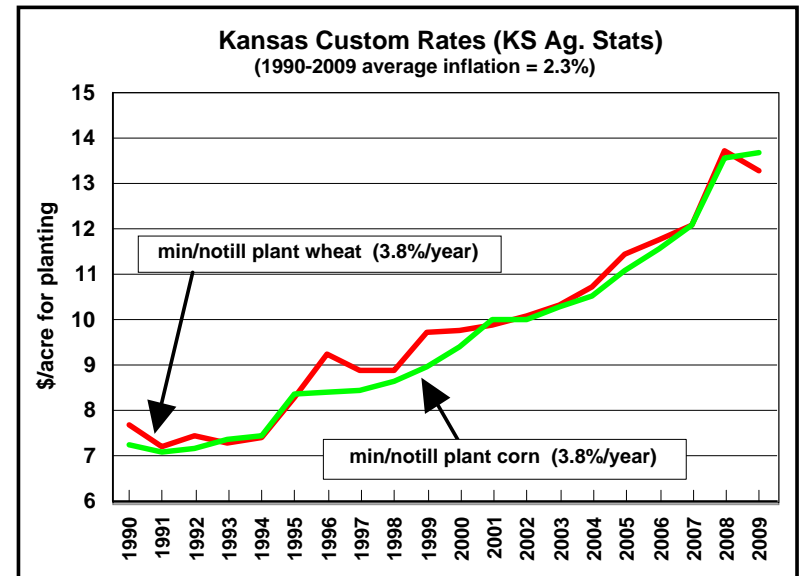
Source: USDA Agricultural Prices

Growth rates in custom rates similar to inflation...



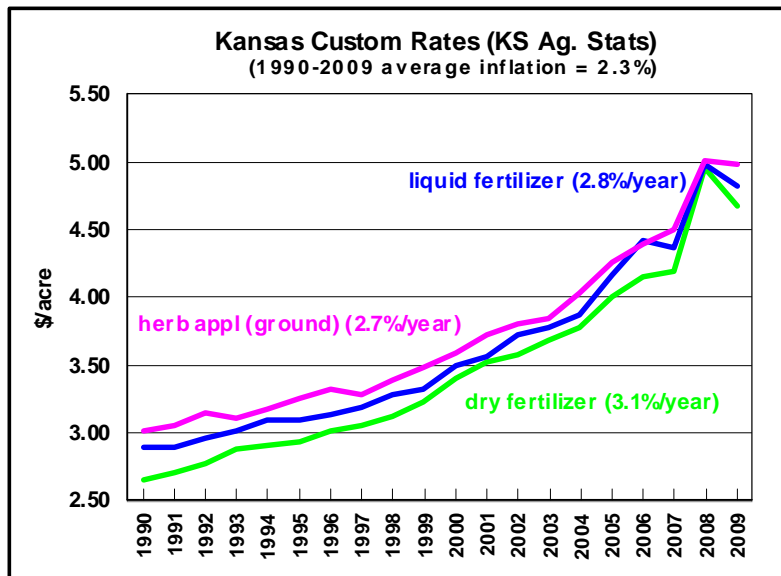
Source: Kansas Agricultural Statistics, Custom Rates

Growth rates in custom rates similar to inflation...



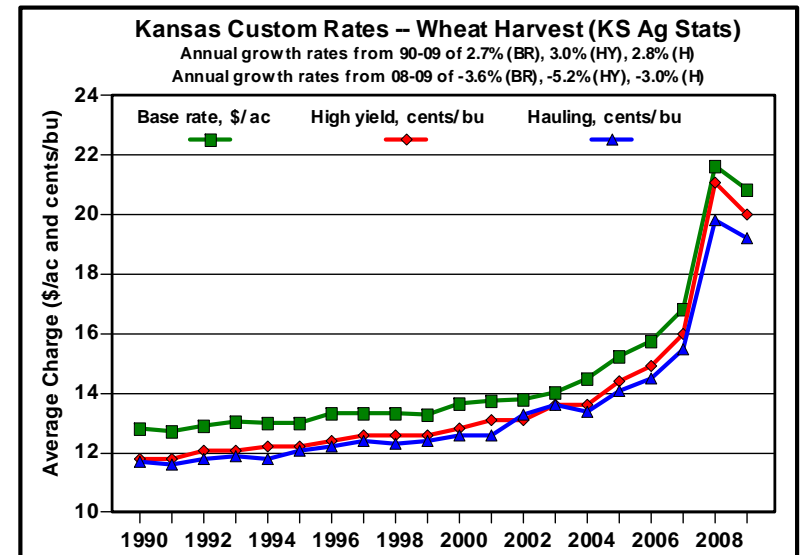
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Growth rates in custom rates similar to inflation...



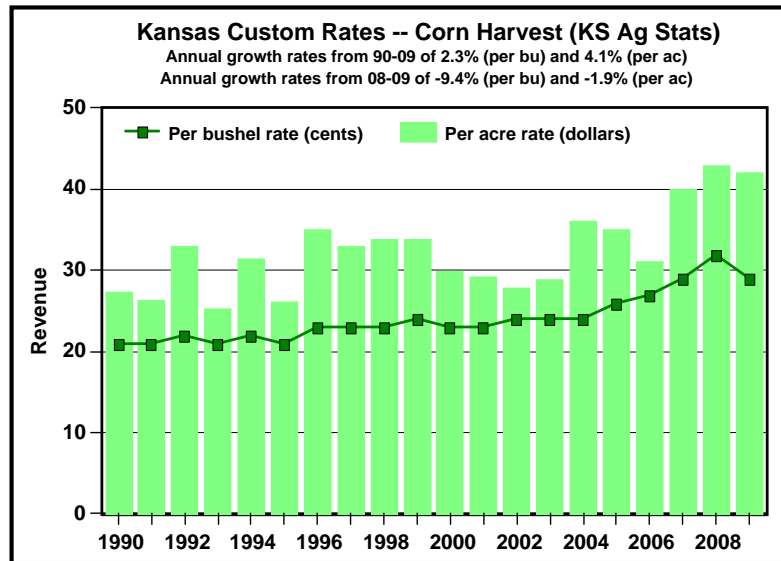
Source: Kansas Agricultural Statistics, Custom Rates

Growth rates in custom rates similar to inflation (2.3%)...



Harvest rates some of the best reported custom rates in Kansas

Growth rates in custom rates similar to inflation (2.3%)...



Harvest rates some of the best reported custom rates in Kansas

Bottom line –

larger investment for big equipment and increasing investment required over time do not necessarily equate to higher costs

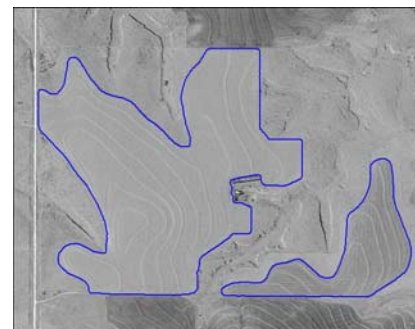


Machinery size issues

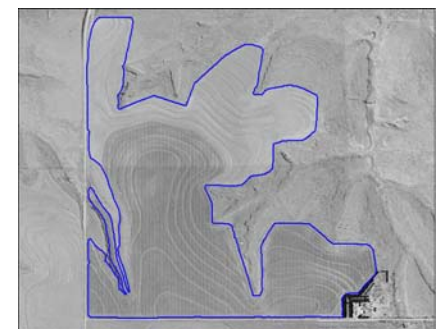
- **Per acre, larger machines require**
 - similar or a bit lower investment
 - much lower labor costs (the big driver)
- **But, since field size has not kept up with machine size, per acre, larger machines:**
 - require more road time (reduces efficiency)
 - have more headland overlap (reduces efficiency)

Typical Kastens fields –

Big-machine input inefficiency can negate labor savings in fields shaped like these...



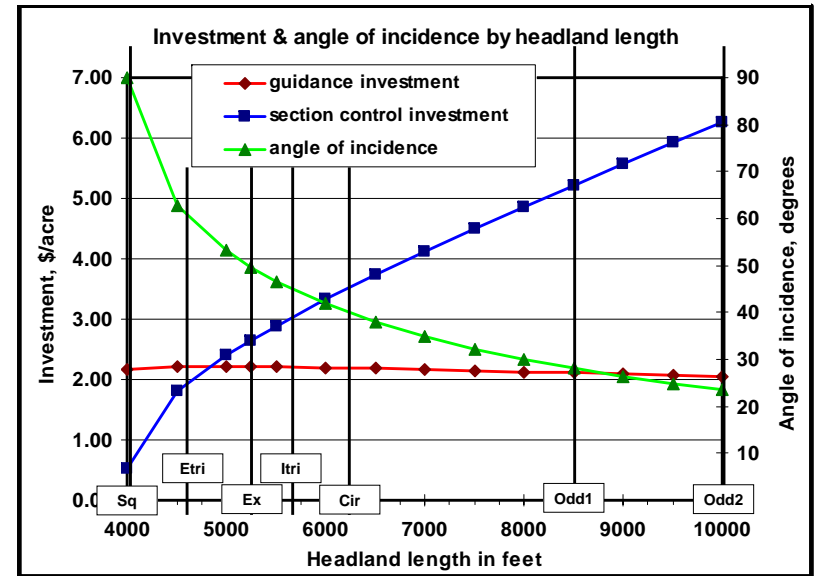
Ranch field (Odd 1):
167.4 acres;
headland is 16,700 feet;
average angle at headland is 28 degrees
90' pass = 20% of field



TT field: (Odd 2)
269.9 acres;
headland is 30,690 feet;
average angle at headland is 21 degrees
90' pass = 23% of field

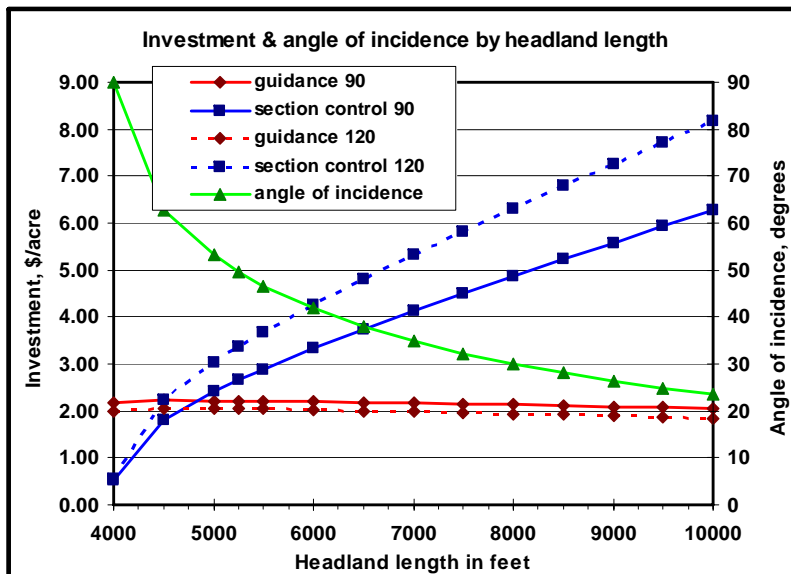
Some machinery technologies can be especially good investments (use *KSU-GPSguidance.xls*)

Field shape matters for section control, but not guidance...



90-foot sprayer in a 75-acre field that varies in shape

Comparing a 120-foot sprayer with the 90-foot one



Machinery and farm growth

- Get big machines . . . but
 - think about ease of road travel
 - get the technologies that enhance field efficiency
- Use machinery intensively. . . but remember
 - agronomics
 - safety
 - quality of life of operators
- Don't forget auxiliary equipment & services
 - Poor labor and equipment matchups (e.g., grain carts, tendering vehicles, pickups) can negate machinery size and intensity benefits

Rapid farm growth

- **Machinery transitions during growth**
 - new plus used, big plus small, custom work in and out
- **Other issues might be more important**
 - Be sure someone allocates the time to the economics and financial management
 - Major decisions in the off-season (crop inputs and rates, machinery trades, financial arrangements)
 - Automate data collection and rate changes
 - People skills! Employees . . . Landlords
 - Pay high wages and high rents

Questions ???

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