

The Economics of Precision Technologies for Sprayers and Planters

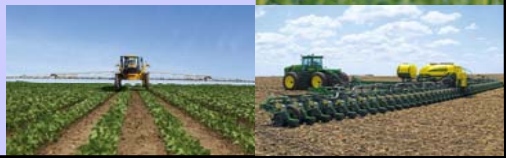
Technology on the Farm Does it Pay?
February 28, 2011
7:00 p.m.
Heritage Tractor, Inc.
Highway 56 East of Baldwin City

Sponsored by K-State Research & Extension—Douglas, Franklin, Johnson, Miami, Osage and Shawnee Counties, and East Central Kansas No-Till Alliance

TOPICS & PRESENTERS
The Economics of Precision Technologies for Sprayers and Planters
Kevin Dhuyvetter, Farm Management Professor, Kansas State University Department of Agricultural Economics
Precision Products for Crop Production: Adam Meyers and Aaron Miller, Ag Management Systems Specialists with Heritage Tractor
Farmer Panel: How I Utilize Technology in My Operation

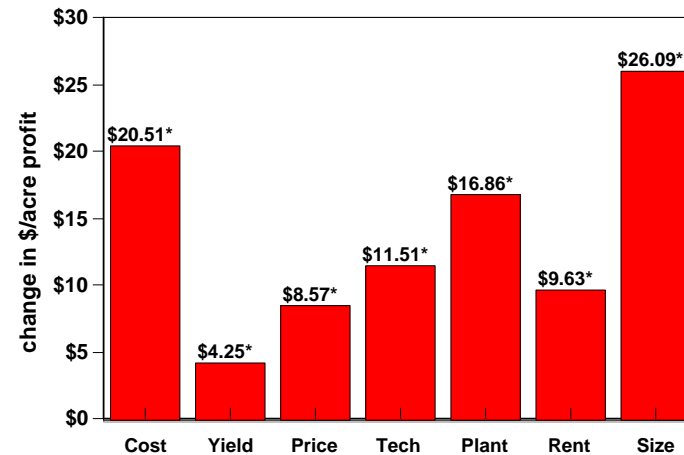
Refreshments served courtesy of Heritage Tractor, Inc. No reservations necessary. Call Douglas County Extension at 785-543-7050 if you need further information.

Kevin C. Dhuyvetter
Department of Ag Economics
Kansas State University
kcd@ksu.edu – 785-532-3527



Factors impacting profitability differences...

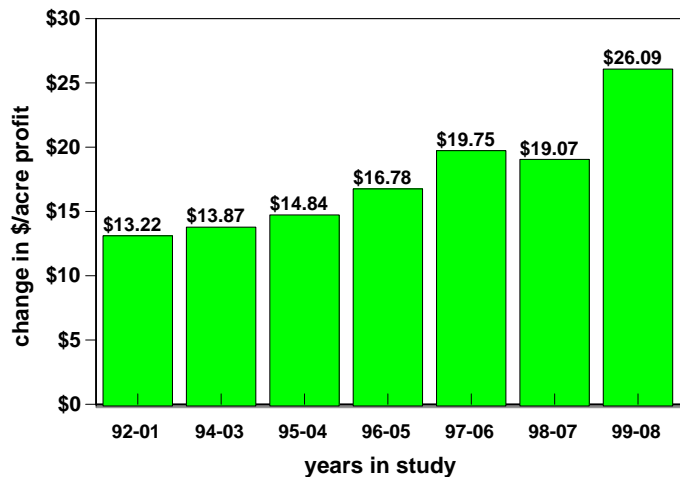
(99-08) diff in profit (over avg farm) by being in best 1/3 of:



* statistically different from 0 at 90% confidence

The impact of size is getting larger – why?

diff in profit (over avg farm) by being in top 1/3 of size

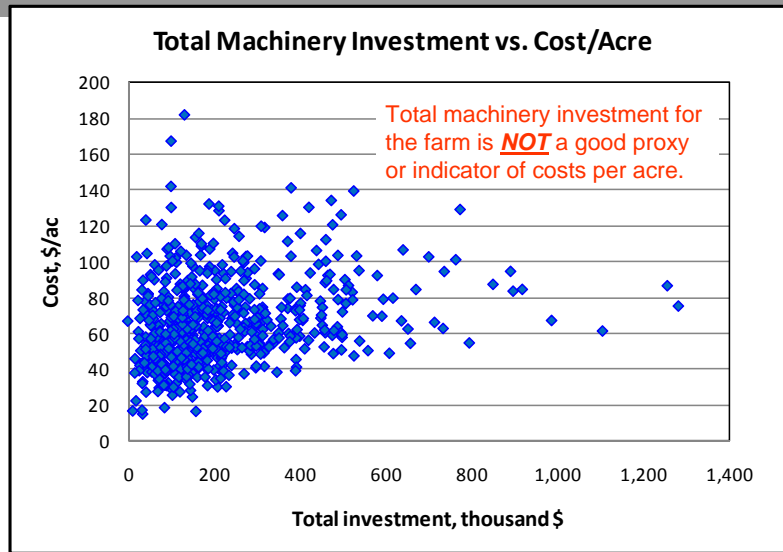


Key drivers of profitability differences among producers...

- Costs
- Technology adoption
- Farm size

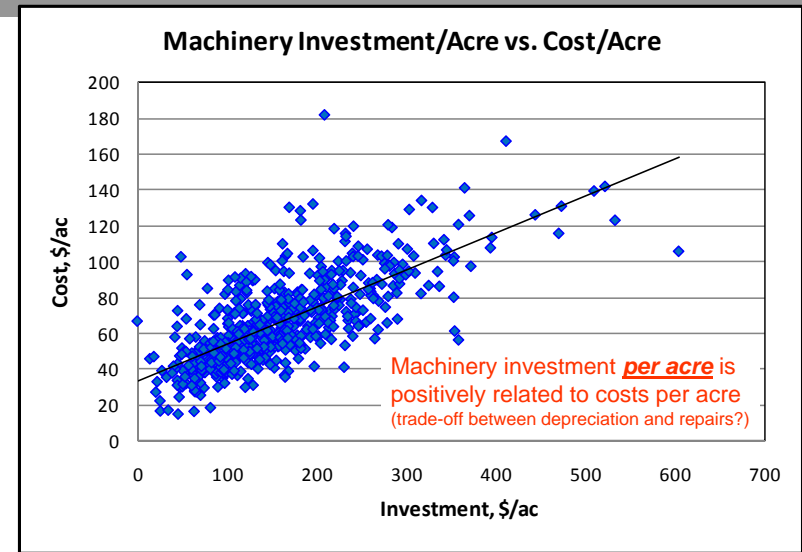
... machinery investment and costs are directly related to these three factors.

Machinery investment is not the same as machinery cost



Source: KFMA non-irrigated crop farms having continuous data from 2005-2009 (minimum of 160 acres and machinery cost/acre > \$10/ac; costs do not include labor – total of 614 farms)

It is important to use assets efficiently...

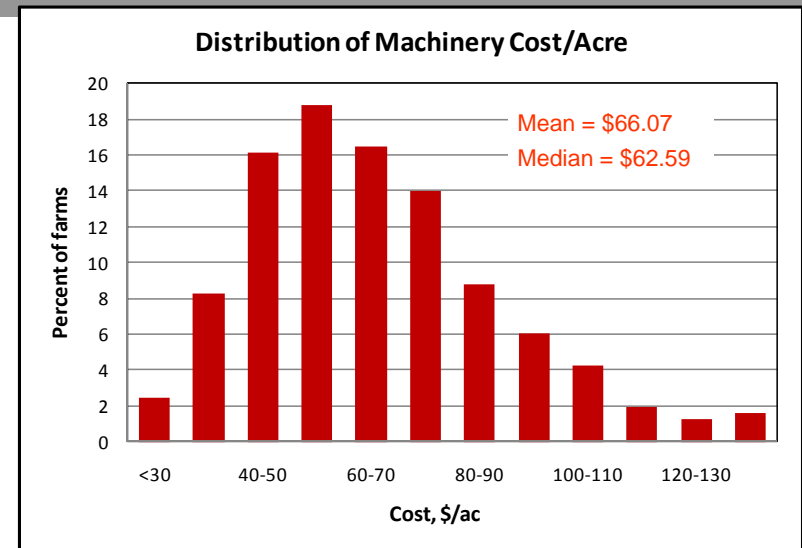


Source: KFMA non-irrigated crop farms having continuous data from 2005-2009 (minimum of 160 acres and machinery cost/acre > \$10/ac; costs do not include labor – total of 614 farms)

Machinery cost categories...

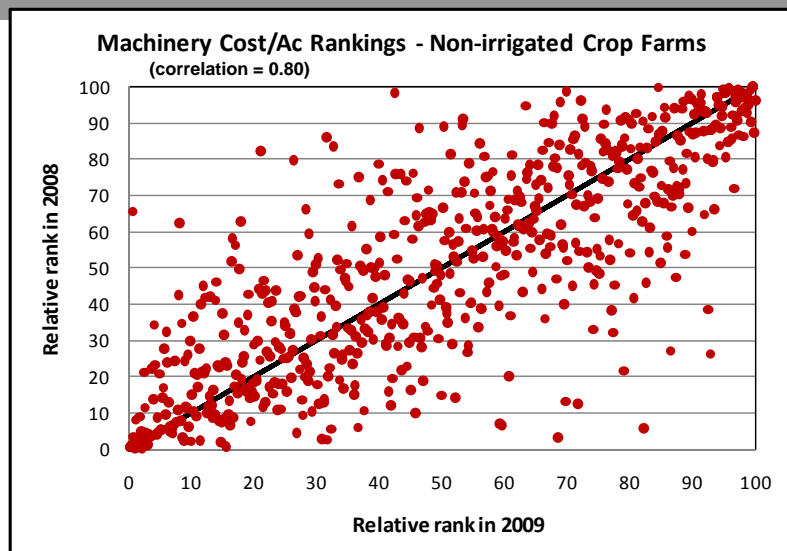
- Repair and maintenance
- Labor
- Depreciation (market, not tax depreciation)
- Interest (opportunity interest)
- Fuel and lubrication
- Taxes, insurance, and shelter

Machinery cost varies considerably across producers...



Source: KFMA non-irrigated crop farms having continuous data from 2005-2009 (minimum of 160 acres and machinery cost/acre > \$10/ac; costs do not include labor – total of 614 farms)

Machinery costs per acre are relatively persistent...



Source: KFMA non-irrigated crop farms having continuous data from 2005-2009 (minimum of 160 acres and machinery cost/acre > \$10/ac – total of 614 farms)

Machinery management...

- Ways farm managers lower their machinery costs to distinguish themselves from others for the purpose of increasing profit...
 - knowing when to own versus hire
 - knowing whether to buy new or used
 - knowing which technologies are profitable and to invest in (e.g., guidance systems, automatic controllers)

Machinery decision-tools available from KSU...

www.agmanager.info



OwnCombine.xls



KSU-GPSguidance.xls



OwnBaler.xls



OwnSprayer.xls



KSU-MachCost.xls



OwnTractor.xls

Guidance & Section Control Profit Calculator



Welcome | Instructions | Whole Farm Data | Sprayer | Planter | Fertilizer | Other | Whole Farm Results

To Get Started, Click the Instructions Tab

welcome to the
Guidance & Section Control Profit Calculator

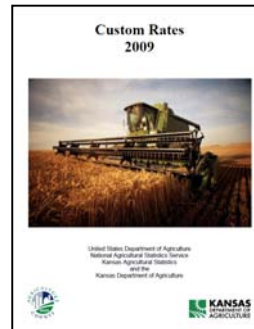
<p>Sponsored by</p> <p>37733 Euclid Avenue Willoughby, Ohio 44094 440-942-2000 www.precisionagworks.com</p>	<p>Developers</p> <p>Kevin C. Dhuyvetter Extension Agricultural Economist Kansas State University (785) 532-3527 kod@ksu.edu</p> <p>Terry L. Kastens Professor Emeritus Kansas State University (785) 626-9000 terrykastens@agecon.ksu.edu</p>	<p>Developed by</p> <p>Craig M. Smith Graduate Research Assistant Kansas State University craigsmith@agecon.ksu.edu</p> <p>Dietrich L. Kastens Geographer/Producer Kastens, Inc. (785) 626-4600 dietrich@kastensinc.com</p> <p>Department of Ag Economics Kansas State University Manhattan, KS 66506 www.agmanager.info</p>
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Version 2.26.2010

In addition to this web dashboard, calculator is also available as an Excel spreadsheet.

Machinery cost categories...

- Repair and maintenance
- Labor
- Depreciation (market, not tax depreciation)
- Interest (opportunity interest)
- Fuel and lubrication
- Taxes, insurance, and shelter
- Custom hire – a reasonable proxy for average machinery cost



An aside, related to custom rates...

Kansas Ag Statistics discontinued their survey of custom rates in 2010. Projected state averages for most all operations have been projected based on inflation and fuel prices and are reported in KSU paper available on www.agmanager.info

Table 2. Historical and Projected Custom Rates – PLANTING (\$/acre)

Operation	Historical			Projections		2011 versus 2010		R ²
	2007	2008	2009	2010	2011	\$/unit chg	% chg	
Regular-Till	\$9.54	\$11.09	\$11.14	\$11.09	\$11.89	\$0.80	7.2%	0.961
Small grains	\$10.65	\$12.30	\$12.61	\$12.45	\$13.24	\$0.79	6.4%	0.959
Sorghum	\$10.91	\$12.51	\$12.52	\$12.45	\$13.06	\$0.61	4.9%	0.976
Corn	\$10.94	\$12.87	\$12.58	\$12.65	\$13.31	\$0.66	5.2%	0.977
Soybeans	\$12.60	\$14.65	\$14.02	\$14.11	\$14.85	\$0.74	5.3%	0.962
Grass	\$11.35	\$13.75	\$12.68	\$13.23	\$13.89	\$0.66	5.0%	0.946
Alfalfa								
Minimum-Till or No-Till								
Small grains	\$12.10	\$13.73	\$13.31	\$13.45	\$13.84	\$0.35	2.6%	0.964
Sorghum	\$12.04	\$13.49	\$13.63	\$13.54	\$13.99	\$0.45	3.3%	0.970
Corn	\$12.09	\$13.57	\$13.70	\$13.63	\$14.05	\$0.42	3.1%	0.977
Soybeans	\$12.34	\$14.07	\$13.68	\$13.93	\$14.26	\$0.33	2.4%	0.974

Table 3. Historical and Projected Custom Rates – CHEMICAL APPLICATIONS (\$/acre)

Operation	Historical			Projections		2011 versus 2010		R ²
	2007	2008	2009	2010	2011	\$/unit chg	% chg	
Row crop cultivate w/ fertilizer	\$6.33	\$6.41	\$6.00	\$6.04	\$6.24	\$0.20	2.5%	0.805
Row crop cultivate w/o fertilizer	\$6.32	\$6.46	\$7.24	\$6.03	\$6.35	\$0.32	4.0%	0.868
Dry fertilizer application	\$4.20	\$4.96	\$4.68	\$4.80	\$4.99	\$0.19	3.9%	0.983
Liquid fertilizer application	\$4.37	\$4.98	\$4.82	\$4.87	\$5.05	\$0.18	3.7%	0.983
Anhydrous ammonia application	\$8.46	\$10.20	\$10.55	\$10.23	\$11.12	\$0.89	8.6%	0.919
Aerial herbicide application	\$5.19	\$6.20	\$6.93	\$6.43	\$6.95	\$0.52	8.1%	0.762
Ground herbicide application	\$4.50	\$5.01	\$4.98	\$4.96	\$5.13	\$0.17	3.5%	0.979
Aerial insecticide application	\$5.48	\$6.20	\$6.60	\$6.39	\$6.62	\$0.43	6.7%	0.865
Ground insecticide application	\$4.43	\$5.07	\$4.95	\$4.97	\$5.13	\$0.16	3.2%	0.980

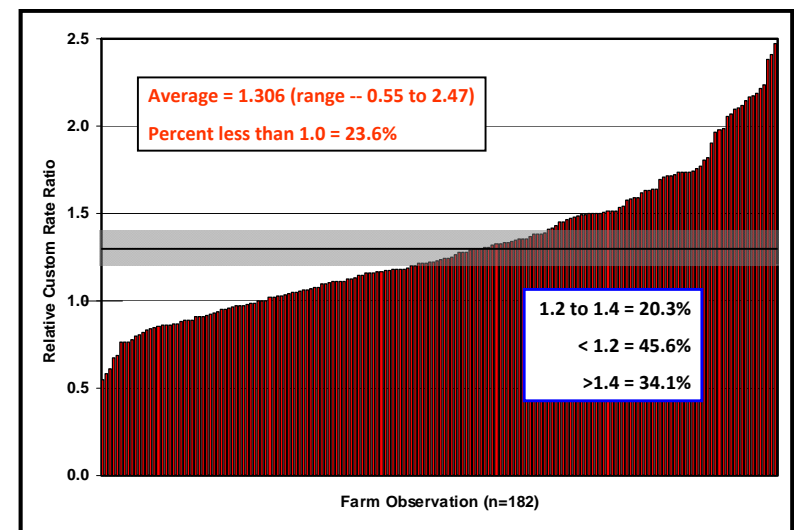
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Soybeans	\$12.65	\$13.31	\$0.66	5.2%	0.977	
Grass	\$14.11	\$14.85	\$0.74	5.3%	0.962	
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Soybeans	\$13.93	\$14.26	\$0.33	2.4%	0.974	

Very few individuals are “average”...



Source: Beaton MS thesis, 2003 (data from 2001)

What leads to some producers having lower costs?

- 1) Hard to beat intensity of use as a cost reducer...
- 2) Hard to beat machinery size as a cost reducer...
(at least historically)

Large (wide) machine issues

- Need large turnaround area, increasing the area of the field in headlands
- Can we make the larger machines behave as though they were smaller, at least in terms of the portion of a headland affected by input doubling-up?
 - boom or section shut-offs

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)
- 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)



Department of Agricultural Economics

- Adopting new machinery technologies is an important way that farm managers lower their machinery costs to distinguish themselves from others for the purpose of increasing profit.
 - Using GPS to assist machinery operations is an especially important new technology.

Machinery technology...

Machinery-related technologies have changed farming quite significantly over time...



Machinery technology...

Machinery-related technologies have changed farming quite significantly over time...



but this technology requires a different mindset and skill set, and depending on your abilities, it may or may not lower costs.

General machinery overlap issues

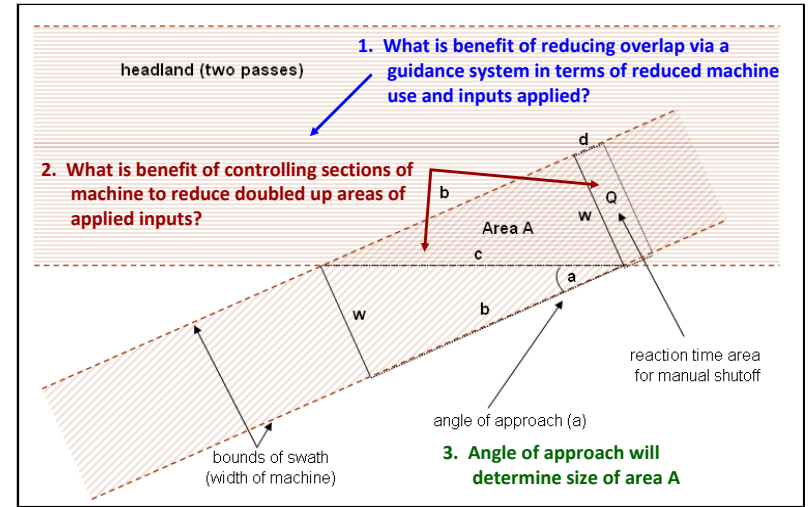
- **Extra machine operation**
 - Increases machinery costs since overlap areas are covered more than once, so more acres have to be farmed than which are in the field
- **May affect applied input usage**
 - Increases crop input cost since overlap areas are covered more than once and thus get more seed, fertilizer, herbicide, etc.
- **These are *cost* issues**

Field headland issues (where the action is)

- **Headlands cause economic problems:**
 - Increase cost of machine operations
 - Doubling up of machine operations
 - Machines need to slow down for turnaround
 - Increase crop input costs due to doubling up
 - Double-planting, -applying, -tilling, and extra compaction can reduce crop yield, thus revenue
- **Portion of field covered by headlands:**
 - Affects *costs* and *revenues*
 - Greatly affected by field size and shape
 - Especially affected by width of machine

- Regardless, all situations are quite site- and machine-specific
 - Hard to make general rules of thumb across operations
 - Requires individual-situation analysis
 - So, we developed a decision tool (an Excel spreadsheet) to aid such decisions, called
 - KSU-GPSguidance.xls (at www.agmanager.info)
- To get some understanding, economic results for an example farm will be reported


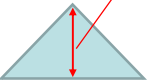


Field headland



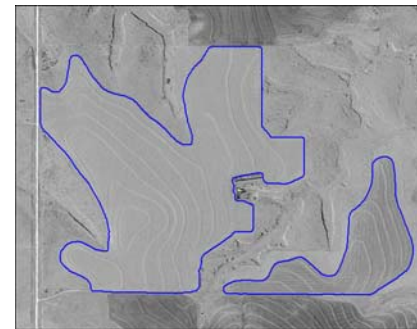
Areas A and Q and turnaround counterparts will have a) doubling-up of inputs and b) possible yield losses due to this doubling-up. After the turnaround there will be overlap along b, also accounted for.

Stylized field shapes (farm left to right)

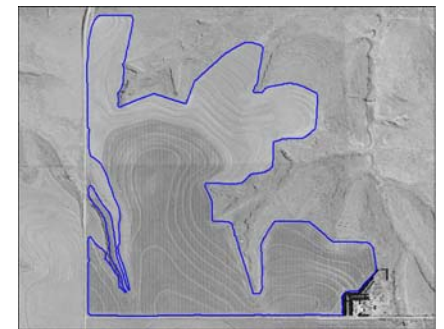
Maximum width of field, perpendicular to direction of swaths (passes) = 2,640 feet

-  Square; hit ends at 90 degree angles, 5,280 feet of headlands in 160 acre field
-  Isosceles right triangle; hit ends at 60 degree angles, 7,467 feet of headlands in 160 acre field
-  Equilateral triangle; hit ends at 45 degree angles, 8,024 feet of headlands in 160 acre field
-  Circle; hit ends at angles varying from 0 to 90 degrees (avg. 40 degrees) 9,359 feet of headlands in 160 acre field

Kastens fields – less efficient than squares, triangles or circles



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

The economics of autoguidance and boom/section control...



- Sprayer -- returns to guidance system and section controller
- Planter -- returns to individual row controllers
- Vary acres "covered" per year
- Vary cost of input (i.e., herbicide and seed)
- Field size/shape held constant

Microsoft Excel - GuidanceSectionControlProfitCalculatorFeb20111.xls
GuidanceSectionControlProfitCalculator.xls --- available on www.AgManager.info

Economic Analysis of Guidance Systems and Section Controls

Section A: Whole farm information -- INPUTS

Size of typical field	acres	75
Maximum width of field, perpendicular to direction of swaths (passes)	feet	2,571
Running distance of headlands to cover for field	feet	8,000
Average angle of approach to headland in degrees (0-90)	degrees	40.00
Interest rate for investment analysis, percent	interest	8.00%
Number of years for amortization	years	4
Annual non-ownership costs for current technology (e.g., subscriptions, fees, support)	\$/farm	\$0
Annual non-ownership costs expected for new technology (e.g., subscriptions, fees, support)	\$/farm	\$2,500

Percent of category to include in net benefits total

Machine costs	1
Input costs	1
Yield revenue	1
Non-ownership costs	0

Include in whole-farm analysis (1=Yes, 0=No)

units	Sprayer	Planter	Fertilizer	Other	Other	Farm Total Avg
	1	1	1			

Section B: Equipment specific information -- INPUTS

Number of swaths (passes) needed to cover headlands	count	2	2	2		2
Width of machine	feet	90	40	48		75
Turnaround speed is this portion of field speed	percent	67%	75%	67%		68%
Area in headlands	acres	32.48	14.55	17.45	0.00	27.08
Number of machine or boom sections to be controlled	count	5	16	4		6.3
Reaction distance (overlap) on manual shutdown of boom	feet	15	10	10		13

Custom rate of machine operation, \$/ application acre	\$	\$5.10	\$14.07	\$10.99		\$7.47
Cost of input (fertilizer, herbicide, etc.), \$/application acre	\$	\$14.95	\$86.94	\$36.30		\$28.82
Lost yield revenue for doubling up, \$/doubled-up acre	\$	\$0.00	\$119.63	\$0.00		\$19.95
Current overlap to consider	percent	7.99%	0.00%	7.99%		6.07%
Expected overlap to consider	percent	1.75%	0.00%	1.75%		1.52%

Total acres of use annually	acres	10,000	2,000	3,000		15,000
Expected autoguidance investment	dollars	\$15,000	\$7,500	\$7,500		\$30,000
boom section/control autoguidance, \$/acre	dollars	\$10,000	\$15,000	\$10,000		\$35,000
boom/section control, \$/acre	\$	\$1.00	\$7.50	\$3.33	n/a	\$2.33

Average angle is similar to what it would be if field were a circle.

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boom/section control, \$/acre	\$	\$1.00	\$7.50	\$3.33	n/a	\$2.33

Non-ownership costs -- might these be negative?

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Economic Analysis of Guidance Systems and Section Controls

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Percent of category to include in net benefits total

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Input costs	1
Yield revenue	1
Non-ownership costs	0

Include in whole-farm analysis (1=Yes, 0=No)

units	Sprayer	Planter	Fertilizer	Other	Other	Farm Total Avg
	1	1	1			

Section B: Equipment specific information -- INPUTS

Number of swaths (passes) needed to cover headlands	count	2	2	2		2
Width of machine	feet	90	40	48		75
Turnaround speed is this portion of field speed	percent	67%	75%	67%		68%
Area in headlands	acres	32.48	14.55	17.45	0.00	27.08
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boom/section control, \$/acre	\$	\$1.00	\$7.50	\$3.33	n/a	\$2.33

Toggle lets user include any or all impacts...

GuidanceSectionControlProfitCalculator.xls --- available on www.AgManager.info

Economic Analysis of Guidance Systems and Section Controls

Section A: Whole farm information -- INPUTS

Size of typical field: 75 acres

Maximum width of field, perpendicular to direction of swaths (passes): 2,571 feet

Running distance of headlands to cover for field: 8,000 feet

Average angle of approach to headland in degrees (0-90): 40.00 degrees

Interest rate for investment analysis, percent: 8.00%

Number of years for amortization: 4 years

Annual non-ownership costs for current technology (e.g., subscriptions, fees, support): \$farm 30

Annual non-ownership costs expected for new technology (e.g., subscriptions, fees, support): \$farm 12,500

Percent of category to include in net benefits total

Machine costs: 1

Input costs: 1

Yield revenue: 1

Non-ownership costs: 0

Include in whole-farm analysis (1=Yes, 0=No)

units	Sprayer	Planter	Fertilizer	Other	Other	Farm Total Avg
1	1	1	1			

Section B: Equipment-specific information -- INPUTS

Number of swaths (passes) needed to cover headlands: 2

Width of machine: 90 feet

Turnaround speed is this portion of field speed: 67%

Area in headlands: 32.48 acres

Number of machine or boom sections to be controlled: 5

Reaction distance (overlap) on manual shutoff of boom: 15 feet

Custom rate of machine operation, \$/application acre: \$5.10

Cost of input (fertilizer, herbicide, etc.), \$/application acre: \$14.95

Last yield revenue for doubling up, \$/doubled-up acre: \$0.00

Current overlap to consider: 7.00%

Expected overlap to consider: 1.75%

Total acres of use annually: 10,000

Expected autoguidance investment: \$15,000

autoguidance: \$15,000

boom section/control: \$10,000

autoguidance, \$/acre: \$1.50

boom section control, \$/acre: \$1.00

Can include multiple machines to get results for whole farm.

GuidanceSectionControlProfitCalculator.xls --- available on www.AgManager.info

Economic Analysis of Guidance Systems and Section Controls

Section A: Whole farm information -- INPUTS

Size of typical field: 75 acres

Maximum width of field, perpendicular to direction of swaths (passes): 2,571 feet

Running distance of headlands to cover for field: 8,000 feet

Average angle of approach to headland in degrees (0-90): 40.00 degrees

Interest rate for investment analysis, percent: 8.00%

Number of years for amortization: 4 years

Annual non-ownership costs for current technology (e.g., subscriptions, fees, support): \$farm 30

Annual non-ownership costs expected for new technology (e.g., subscriptions, fees, support): \$farm 12,500

Percent of category to include in net benefits total

Machine costs: 1

Input costs: 1

Yield revenue: 1

Non-ownership costs: 0

Include in whole-farm analysis (1=Yes, 0=No)

units	Sprayer	Planter	Fertilizer	Other	Other	Farm Total Avg
1	1	1	1			

Section B: Equipment-specific information -- INPUTS

Number of swaths (passes) needed to cover headlands: 2

Width of machine: 90 feet

Turnaround speed is this portion of field speed: 67%

Area in headlands: 32.48 acres

Number of machine or boom sections to be controlled: 5

Reaction distance (overlap) on manual shutoff of boom: 15 feet

Custom rate of machine operation, \$/application acre: \$5.10

Cost of input (fertilizer, herbicide, etc.), \$/application acre: \$14.95

Last yield revenue for doubling up, \$/doubled-up acre: \$0.00

Current overlap to consider: 7.00%

Expected overlap to consider: 1.75%

Total acres of use annually: 10,000

Expected autoguidance investment: \$15,000

autoguidance: \$15,000

boom section/control: \$10,000

autoguidance, \$/acre: \$1.50

boom section control, \$/acre: \$1.00

Sprayer has benefits of both reduced overlap (i.e., guidance) and reduced input use (section controllers), no yield effect.

GuidanceSectionControlProfitCalculator.xls --- available on www.AgManager.info

Economic Analysis of Guidance Systems and Section Controls

Section A: Whole farm information -- INPUTS

Size of typical field: 75 acres

Maximum width of field, perpendicular to direction of swaths (passes): 2,571 feet

Running distance of headlands to cover for field: 8,000 feet

Average angle of approach to headland in degrees (0-90): 40.00 degrees

Interest rate for investment analysis, percent: 8.00%

Number of years for amortization: 4 years

Annual non-ownership costs for current technology (e.g., subscriptions, fees, support): \$farm 30

Annual non-ownership costs expected for new technology (e.g., subscriptions, fees, support): \$farm 12,500

Percent of category to include in net benefits total

Machine costs: 1

Input costs: 1

Yield revenue: 1

Non-ownership costs: 0

Include in whole-farm analysis (1=Yes, 0=No)

units	Sprayer	Planter	Fertilizer	Other	Other	Farm Total Avg
1	1	1	1			

Section B: Equipment-specific information -- INPUTS

Number of swaths (passes) needed to cover headlands: 2

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Total acres of use annually: 10,000

Expected autoguidance investment: \$15,000

autoguidance: \$15,000

boom section/control: \$10,000

autoguidance, \$/acre: \$1.50

boom section control, \$/acre: \$1.00

Planter has benefits of reduced input use and improved yields in headland (row controllers). Example does not share cost of guidance system (i.e., autoguidance investment equals \$15,000).

90-ft sprayer example -- Results based on machine and input cost savings

Analysis of Precision Ag Technologies for Crop Sprayer vs. Acres Sprayed

Acres covered annually (average field size = 75 acres)	8,000	9,000	10,000	11,000	12,000
Guidance system (going from 7% to 1.75% overlap)					
Sum of net annual benefits, \$/sprayed acre	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75
Investment supported by net annual benefits	\$19,940	\$22,432	\$24,925	\$27,417	\$29,910
Payback in years for given investment	2.69	2.53	2.26	2.03	1.85
Sum of annual net benefits including cost of investment, \$/sprayed acre	\$0.19	\$0.25	\$0.30	\$0.34	\$0.38
ROI given benefits, years, and investment, %	22.0%	28.7%	35.1%	41.4%	47.5%
Section control (controlling 90' boom in 5 sections)					
Sum of net annual benefits, \$/sprayed acre	\$1.41	\$1.41	\$1.41	\$1.41	\$1.41
Investment supported by net annual benefits	\$37,413	\$42,090	\$46,767	\$51,444	\$56,120
Payback in years for given investment	0.95	0.84	0.76	0.69	0.63
Sum of annual net benefits including cost of investment, \$/sprayed acre	\$1.02	\$1.00	\$1.11	\$1.14	\$1.16
ROI given benefits, years, and investment, %	106.8%	121.8%	136.7%	151.4%	166.1%
Guidance system and Section control ROI %	58.2%	68.2%	77.0%	87.5%	97.0%

Analysis of Precision Ag Technologies for Crop Sprayer vs. Acres Sprayed

Investment supported, \$

Payback, years

Acres sprayed annually

--- Inv. Supported (Guidance)

--- Inv. Supported (Section Ctrl)

--- Payback (Guidance)

--- Payback (Section Ctrl)

90-ft sprayer example – results based on machine and input cost savings

Impact of Acres Covered on Economics of Guidance System¹

Annual acres	Investment supported ²	Return on investment ^{2,3}	Payback years ³
14,000	\$34,895	59.3%	1.6
12,000	\$29,910	47.5%	1.9
10,000	\$24,925	35.1%	2.3
8,000	\$19,940	22.0%	2.9
6,000	\$14,955	7.9%	4.0
4,000	\$9,970	-8.2%	6.6
2,000	\$4,985	-28.6%	20.7

¹ Machine and input cost savings reducing overlap from 7.0% to 1.75%

² Based on four-year amortization

³ Given \$15,000 investment

Impact of Acres Covered on Economics of Section Control¹

Annual acres	Investment supported ²	Return on investment ^{2,3}	Payback years ³
14,000	\$65,474	195.1%	0.5
12,000	\$56,120	166.1%	0.6
10,000	\$46,767	136.7%	0.8
8,000	\$37,413	106.8%	1.0
6,000	\$28,060	75.9%	1.3
4,000	\$18,707	43.0%	2.0
2,000	\$9,353	5.1%	4.3

¹ Automatic control of 5 boom sections, input cost savings (guidance exists)

² Based on four-year amortization

³ Given \$10,000 investment

As with most all technologies, the returns to investing in guidance systems and section controls is not scale neutral...

Given the assumptions for this example, the returns to investing in section controls are much higher than guidance systems (but you need the guidance system to realize these benefits)

90-ft sprayer example – results based on machine and input cost savings

... but, as input costs increase, these technologies will pay for smaller operations as well (plus investment required likely will fall over time).

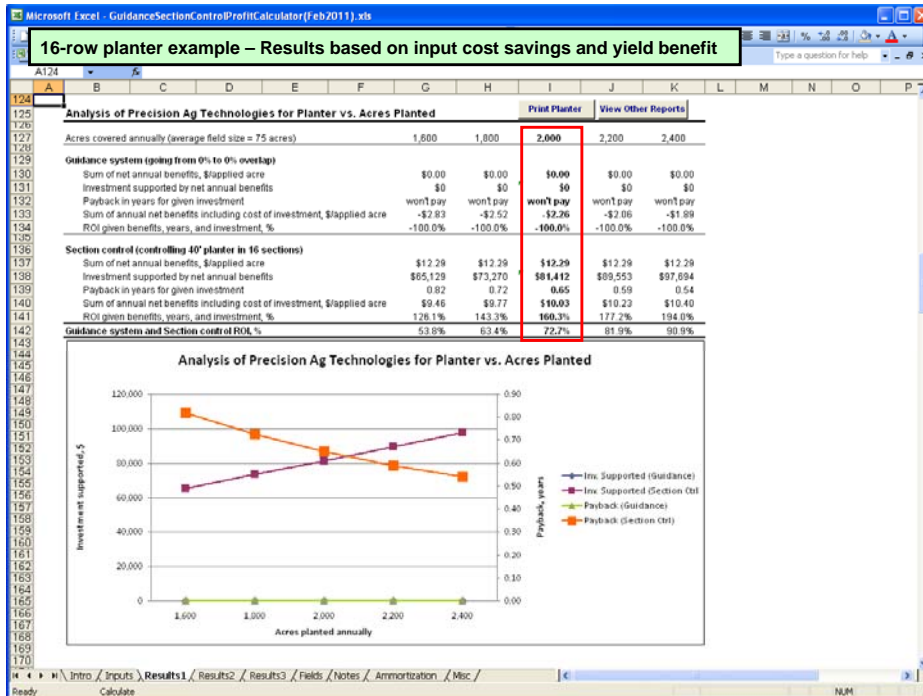
Annual acres	Average cost of input, \$/application acre				
	\$5.00	\$10.00	\$15.00	\$20.00	\$25.00
14,000	26.7%	73.5%	116.0%	156.9%	197.0%
12,000	18.3%	60.0%	97.4%	133.0%	167.7%
10,000	9.5%	46.1%	78.3%	108.6%	138.1%
8,000	-0.1%	31.4%	58.5%	83.7%	107.9%
6,000	-10.7%	15.5%	37.6%	57.7%	76.8%
4,000	-23.0%	-2.3%	14.6%	29.6%	43.6%
2,000	-39.1%	-24.5%	-13.1%	-3.4%	5.5%

¹ Machine and input cost savings reducing overlap from 7.0% to 1.75%

Automatic control of 5 boom sections, input cost savings

Based on four-year amortization

Given \$25,000 investment



16-row planter example – results based on input savings and yield improvement

Impact of Acres Covered on Economics of Section Control¹

Annual acres	Investment supported ²	Return on investment ^{2,3}	Payback years ³
4,000	\$162,823	326.7%	0.3
3,500	\$142,470	285.5%	0.4
3,000	\$122,117	244.0%	0.4
2,500	\$101,765	202.4%	0.5
2,000	\$81,412	160.3%	0.7
1,500	\$61,059	117.4%	0.9
1,000	\$40,706	72.7%	1.3

¹ Automatic control of individual rows, input cost savings and yield benefit

² Based on four-year amortization

³ Given \$15,000 investment -- guidance already exists

Impact of Acres Covered on Economics of Section Control¹

Annual acres	Investment supported ²	Return on investment ^{2,3}	Payback years ³
4,000	\$162,823	160.3%	0.3
3,500	\$142,470	139.0%	0.4
3,000	\$122,117	117.4%	0.4
2,500	\$101,765	95.4%	0.5
2,000	\$81,412	72.7%	0.7
1,500	\$61,059	49.0%	0.9
1,000	\$40,706	23.2%	1.3

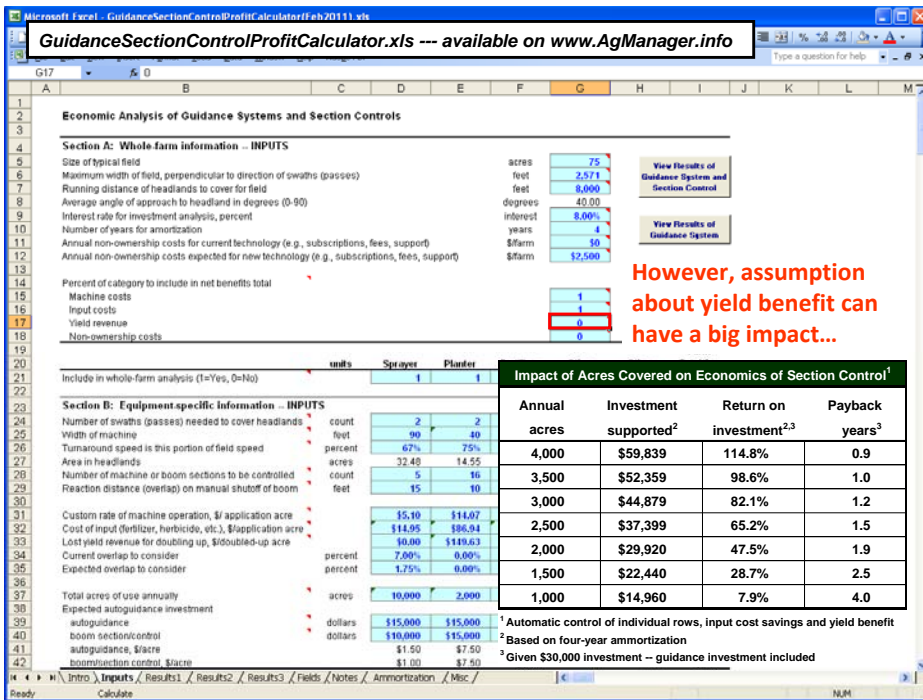
¹ Automatic control of individual rows, input cost savings and yield benefit

² Based on four-year amortization

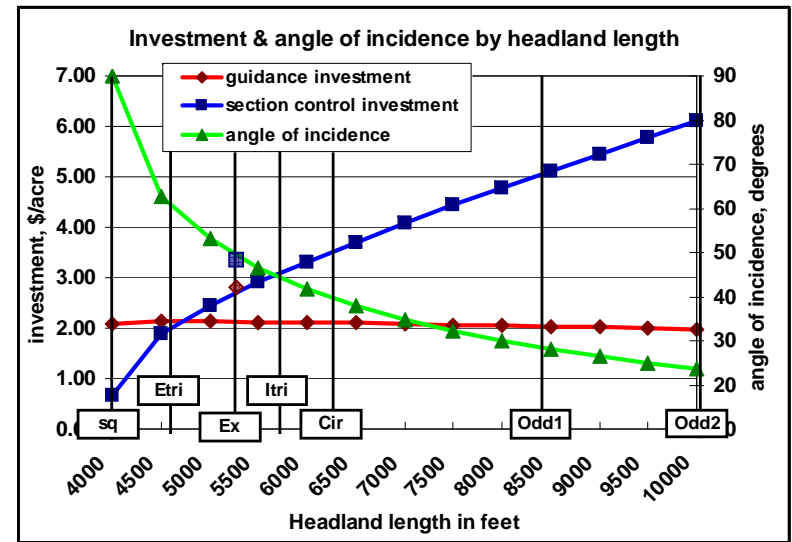
³ Given \$30,000 investment -- guidance investment included

Investing in individual row controllers is pretty much a "no brainer" for operations with sufficient acres, especially if auto-guidance system already exists...

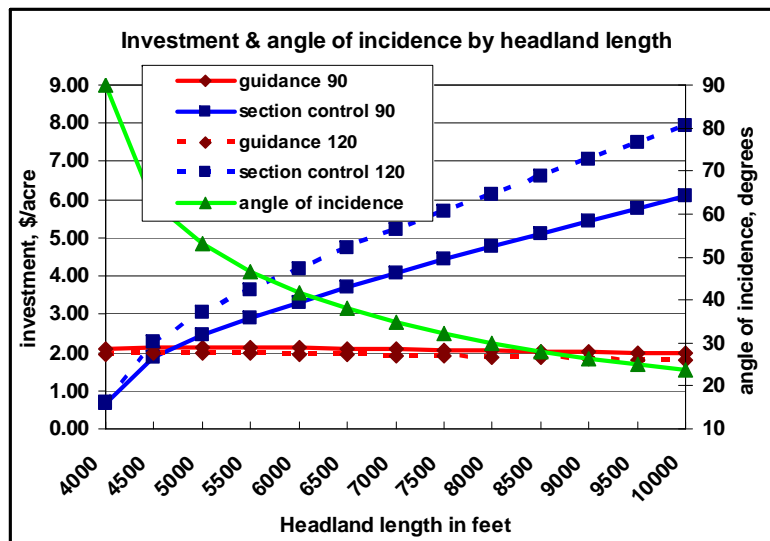
Furthermore, as cost of inputs increase and investment required decreases, this technology will become ever more feasible for smaller operations.



As a reminder, results depend heavily on field shape...



As a reminder, results depend heavily on field shape and equipment size.



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

Summary...

- Machinery costs are an important factor in explaining producer profitability differences
- Machinery costs are fairly persistent – important to know if they are a strength or weakness of your operation
- Economies of scale generally exist such that larger operations have lower machinery costs
- High investment for large equipment does not necessarily equate to high costs
- Numerous tools exist (on AgManager.info) that can be used to help analyze machinery costs

Summary...

- Keep in mind that a tractor is multi-purpose, so GPS benefits can be additive.
- Think carefully about expected yield losses on doubled-up headland acres.
- Field size and shape doesn't much impact benefits to GPS autoguidance,
 - but really impacts benefits to section shutoff.
 - autoguidance and section control share GPS items.
- GPS technologies should help to differentiate custom rates and ultimately land rental rates by field size and shape.
 - Section control may help stabilize these numbers.
- We didn't account for reduced operator fatigue.

Blindly trusting autoguidance??



For more information and decision tools related to farm management, marketing, and risk management go to www.AgManager.info

If interested in receiving weekly *AgManager.info Update* or any of our other Ag Econ newsletters via email, please let me know (kcd@ksu.edu or 785-532-3527).

