The Impact of Higher Input Prices on Crop Profitability

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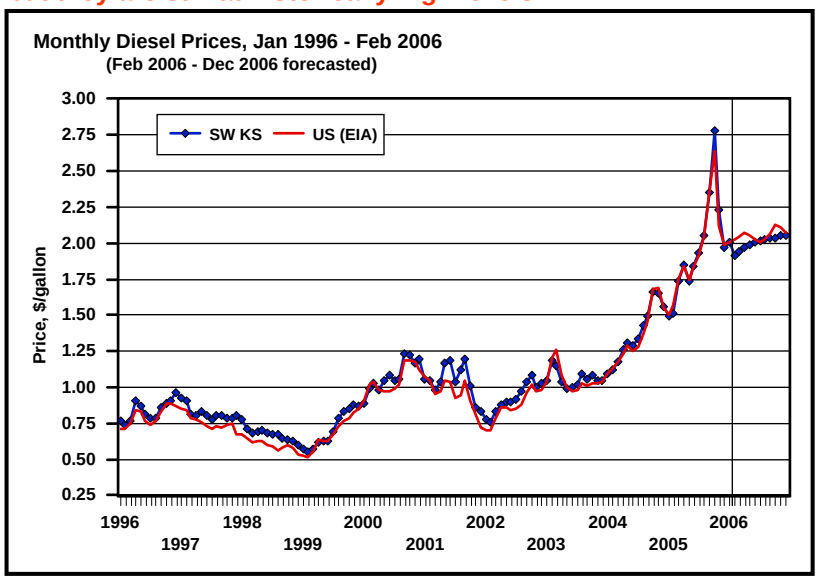
Background thoughts . . .

- Prices for energy-related inputs are at very high levels relative to what we normally expect
- Producers likely cannot do much about the prices they face, but they need to "understand the numbers" to make good management decisions
- Major decisions crop producers have pertain to input levels, crop selection, tillage method, and possibly negotiating leases on rented land

Historical and forecasted energy-related input prices

(diesel fuel, fertilizer, natural gas)

Diesel prices are forecasted to be below 2005 peak level, but they are still at historically high levels …



Based on 2/20/06 futures closing prices

Historical and forecasted diesel prices during principal farming months…

Diesel Fuel Prices

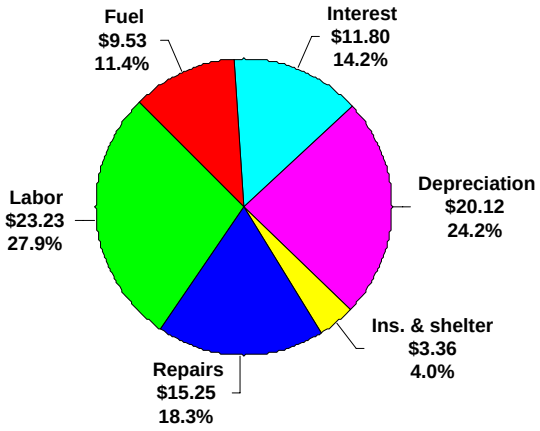
	Mar-Oct Diesel Price			Year-to-year percent change		
Year	SW KS	US (EIA)	Average	SW KS	US (EIA)	Average
2000	$1.09	$1.04	$1.07	-----	-----	-----
2001	$1.09	$0.98	$1.04	0.6%	-6.1%	-2.7%
2002	$0.94	$0.88	$0.91	-14.1%	-10.0%	-12.1%
2003	$1.05	$1.05	$1.05	12.1%	18.6%	15.3%
2004	$1.37	$1.34	$1.36	30.0%	28.4%	29.2%
2005	$2.04	$2.02	$2.03	48.5%	49.9%	49.2%
2006 (F)	$2.00	$2.05	$2.03	-1.5%	1.8%	0.2%
2006 - 2005	($0.03)	$0.04	$0.00	-1.5%	1.8%	0.2%
06 - Avg(00-04)	$0.89	$0.99	$0.94	80.7%	93.7%	87.0%

F = forecast

Based on 2/20/06 futures closing prices

Fuel prices are extremely high, but fuel costs represent one of the smaller cost categories…

Machinery Costs Per Acre, Kansas, 2001
Source: 182 KFMA Members (Beaton)



Total: $83.29

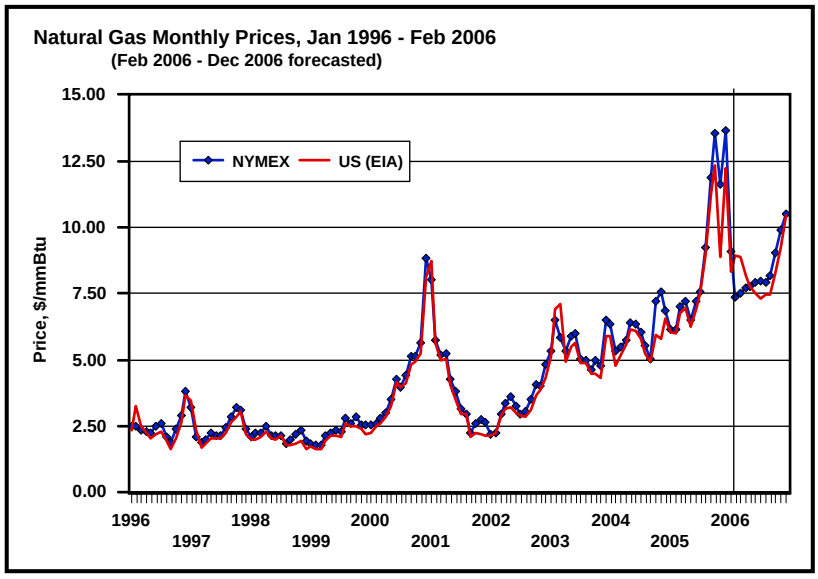
Estimated effect diesel price has on machinery costs per acre based on custom rates…

Diesel Price Impact on Custom Rates for Various Field Operations

Operation	Custom rate*	Fuel price increase, $/gallon ($0.05)	$0.00	$0.10	$0.25	$0.50
		Increase in custom rate, $/acre				
Chiseling	$8.45	($0.04)	$0.00	$0.08	$0.19	$0.39
Field cultivation	$7.13	($0.03)	$0.00	$0.07	$0.16	$0.33
Disking	$6.84	($0.03)	$0.00	$0.06	$0.16	$0.31
Min-till planter	$10.94	($0.05)	$0.00	$0.10	$0.25	$0.50
No-till drill	$11.45	($0.05)	$0.00	$0.10	$0.26	$0.52
Sprayer	$4.26	($0.02)	$0.00	$0.04	$0.10	$0.20
Swather-conditioner	$9.46	($0.04)	$0.00	$0.09	$0.22	$0.43
Round baler	$8.24	($0.04)	$0.00	$0.08	$0.19	$0.38
Combine--wheat	$15.24	($0.07)	$0.00	$0.14	$0.35	$0.70
Combine--soybeans	$21.48	($0.10)	$0.01	$0.20	$0.49	$0.98
Combine--corn	$21.68	($0.10)	$0.01	$0.20	$0.50	$0.99
Increase in 2005 custom rates		**-0.5%**	**0.0%**	**0.9%**	**2.3%**	**4.6%**

* 2005 state average reported by Kansas Agricultural Statistics

Natural gas prices have been falling, but they are still at historically high levels…



Based on 2/20/06 futures closing prices

Historical and forecasted natural gas prices during principal farming months…

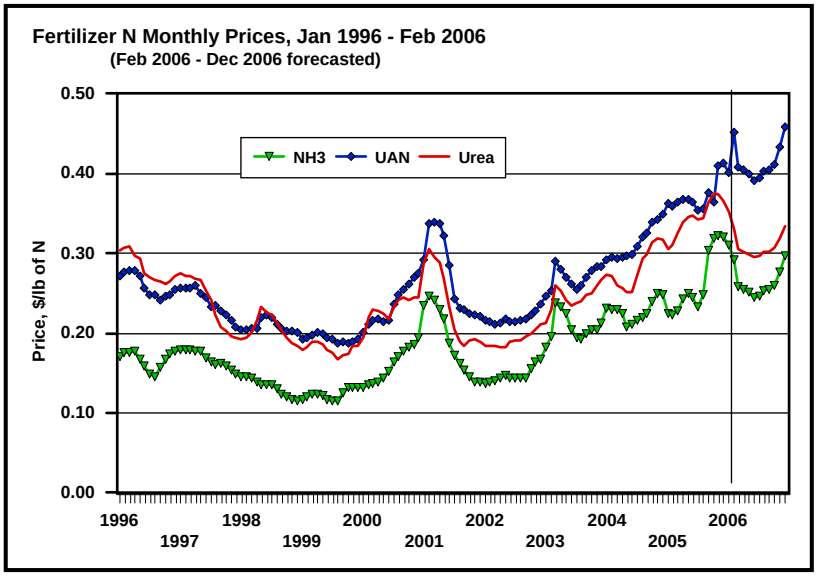
Natural Gas Prices

	Mar-Sep Natural Gas Price			Year-to-year percent change		
Year	NYMEX	US (EIA)	Average	NYMEX	US (EIA)	Average
2000	$3.89	$3.85	$3.87	-----	-----	-----
2001	$3.85	$3.49	$3.67	-1.0%	-9.3%	-5.1%
2002	$3.25	$3.12	$3.18	-15.5%	-10.7%	-13.2%
2003	$5.40	$5.24	$5.32	66.0%	68.2%	67.1%
2004	$5.81	$5.63	$5.72	7.6%	7.5%	7.5%
2005	$8.09	$8.37	$8.23	39.2%	48.6%	43.9%
2006 (F)	$8.23	$7.87	$8.05	1.7%	-6.0%	-2.2%
2006 - 2005	$0.14	($0.50)	($0.18)	1.7%	-6.0%	-2.2%
06 - Avg(00-04)	$3.79	$3.60	$3.70	85.4%	84.5%	84.9%

F = forecast

Based on 2/20/06 futures closing prices

Nitrogen fertilizer prices are at historically high levels…



Based on 2/20/06 futures closing prices

Historical and forecasted fertilizer prices during principal fertilizing months…

Fertilizer Prices (Corn Belt)

Percent of total	40.0%	17.5%	17.5%	20.0%	5.0%	100.0%	
			Oct-May Fertilizer Price*				Yr-to-yr
Year	NH3 (82%)	UAN (32%)	Urea (46%)	- P -	- K -	Wtd Avg	% change
2000	0.136	0.204	0.205	0.211	0.148	0.175	-----
2001	0.217	0.305	0.272	0.193	0.148	0.234	33.2%
2002	0.141	0.218	0.187	0.201	0.144	0.175	-25.3%
2003	0.195	0.253	0.227	0.209	0.141	0.211	20.7%
2004	0.218	0.290	0.262	0.214	0.141	0.234	10.8%
2005	0.238	0.356	0.322	0.223	0.174	0.267	14.4%
2006 (F)	0.291	0.407	0.338	0.234	0.199	0.303	13.6%
2006 - 2005	$0.053	$0.050	$0.016	$0.011	$0.025	$0.036	13.6%
Percent chg	22.2%	14.1%	5.0%	5.0%	14.3%	13.6%	
06 - Avg(00-04)	$0.109	$0.153	$0.108	$0.028	$0.054	$0.098	47.5%
Percent chg	60.3%	60.2%	46.7%	13.7%	37.5%	47.5%	

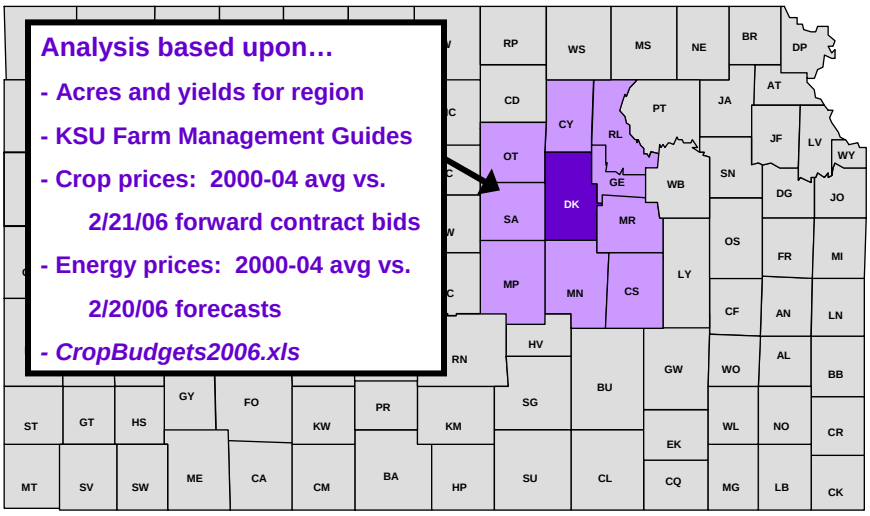
* Oct-Dec of previous year (P = average of 10-34-0 and 18-46-0, K = muriate of potash)

F = forecast (based on 2/20/06 futures closing prices)

Analysis of Crop Profitability

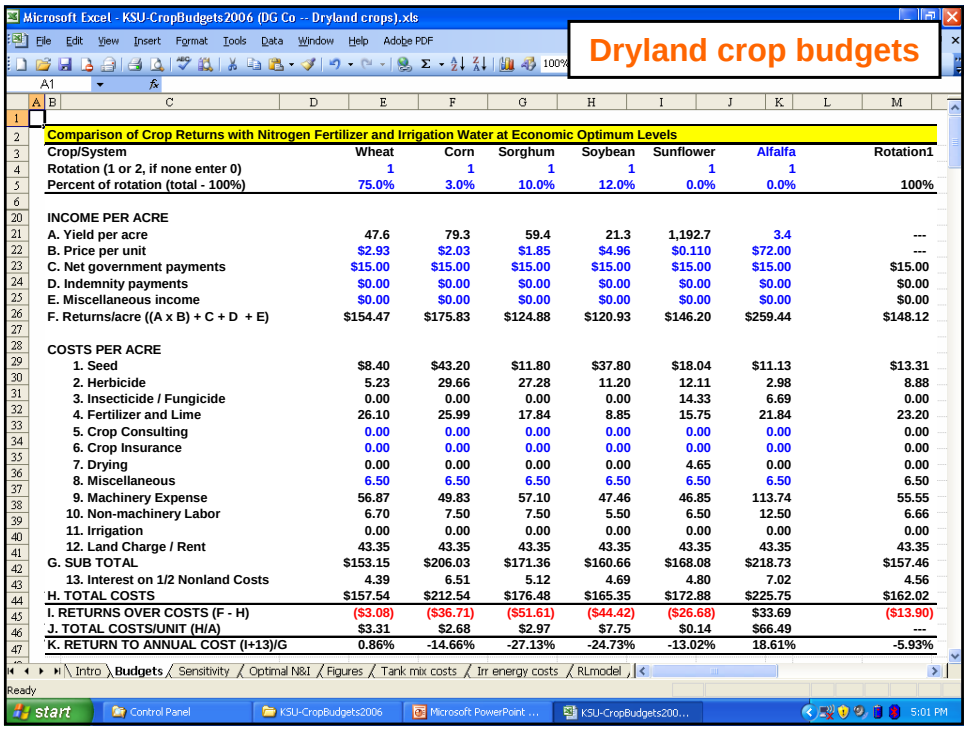
Analysis based upon…

- **Acres and yields for region**
- **KSU Farm Management Guides**
- **Crop prices: 2000-04 avg vs. 2/21/06 forward contract bids**
- **Energy prices: 2000-04 avg vs. 2/20/06 forecasts**
- ***CropBudgets2006.xls***



Cost scenarios…

Input	Average Prices	Current Prices
Machinery	2000-04 time-adjusted custom rates	2000-04 time-adjusted rates x 108.5%
Fertilizer N P K	2000-04 avg $0.212/lb $0.205/lb $0.144/lb	2006 forecast $0.332/lb (+57%) $0.234/lb (+14%) $0.199/lb (+38%)
Irrigation	2000-04 avg $1.18/inch	2006 forecast $2.22/inch (+88%)



Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels

Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower	Alfalfa	Rotation1
Rotation (1 or 2, if none enter 0)	1	1	1	1	1	1	
Percent of rotation (total - 100%)	75.0%	3.0%	10.0%	12.0%	0.0%	0.0%	100%
INCOME PER ACRE							
A. Yield per acre	47.6	79.3	59.4	21.3	1,192.7	3.4	---
B. Price per unit	$2.93	$2.03	$1.85	$4.96	$0.110	$72.00	---
C. Net government payments	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00
D. Indemnity payments	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
E. Miscellaneous income	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
F. Returns/acre ((A x B) + C + D + E)	$154.47	$175.83	$124.88	$120.93	$146.20	$259.44	$148.12
COSTS PER ACRE							
1. Seed	$8.40	$43.20	$11.80	$37.80	$18.04	$11.13	$13.31
2. Herbicide	5.23	29.66	27.28	11.20	12.11	2.98	8.88
3. Insecticide / Fungicide	0.00	0.00	0.00	0.00	14.33	6.69	0.00
4. Fertilizer and Lime	26.10	25.99	17.84	8.85	15.75	21.84	23.20
5. Crop Consulting	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6. Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. Drying	0.00	0.00	0.00	0.00	4.65	0.00	0.00
8. Miscellaneous	6.50	6.50	6.50	6.50	6.50	6.50	6.50
9. Machinery Expense	56.87	49.83	57.10	47.46	46.85	113.74	55.55
10. Non-machinery Labor	6.70	7.50	7.50	5.50	6.50	12.50	6.66
11. Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12. Land Charge / Rent	43.35	43.35	43.35	43.35	43.35	43.35	43.35
G. SUB TOTAL	$153.15	$206.03	$171.36	$160.66	$168.08	$218.73	$157.46
13. Interest on 1/2 Nonland Costs	4.39	6.51	5.12	4.69	4.80	7.02	4.56
H. TOTAL COSTS	$157.54	$212.54	$176.48	$165.35	$172.88	$225.75	$162.02
I. RETURNS OVER COSTS (F - H)	($3.08)	($36.71)	($51.61)	($44.42)	($26.68)	$33.69	($13.90)
J. TOTAL COSTS/UNIT (H/A)	$3.31	$2.68	$2.97	$7.75	$0.14	$66.49	---
K. RETURN TO ANNUAL COST (I+13)/G	0.86%	-14.66%	-27.13%	-24.73%	-13.02%	18.61%	-5.93%

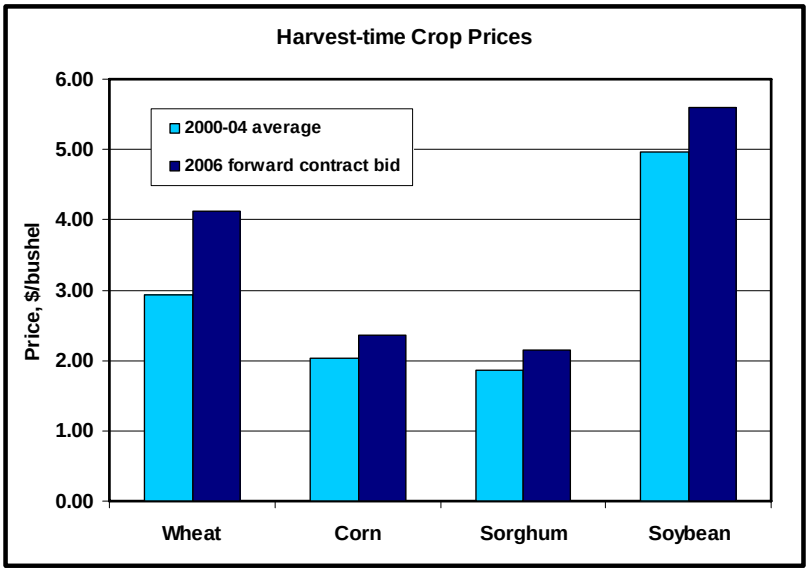
Dryland crops example profitability summary …

Comparison of Crop Returns under Various Input Price Scenarios

Crop	Wheat	Corn	Sorghum	Soybean	Wtd Avg
Base scenario[1]	($3.08)	($36.71)	($51.61)	($44.42)	($13.90)
At forecasted 2006 prices for…					
Fuel[2]	($8.08)	($41.10)	($56.63)	($48.59)	($18.79)
Fertilizer[2]	($12.34)	($45.10)	($55.96)	($44.98)	($21.60)
Irrigation pumping[2]	na	na	na	na	na
Fuel, fert, and irr pumping[2]	($17.33)	($49.46)	($60.96)	($49.16)	($26.48)
Cost change, $/ac	($14.25)	($12.75)	($9.36)	($4.74)	($12.58)

[1] Returns based on current Farm Management Guide costs except fuel, fertilizer, and irrigation pumping (2000-04 avg) and long-run planning prices.
[2] All other costs and crop prices are the same as in base scenario (yields vary with fertilizer and irrigation costs).

While input prices are higher, so are crop prices…



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Irrigation pumping[2]	na	na	na	na	na
Fuel, fert, and irr pumping[2]	($17.33)	($49.46)	($60.96)	($49.16)	($26.48)
Crops[2]	$35.49	($27.30)	($46.85)	($38.59)	$16.48

[1] Returns based on current Farm Management Guide costs except fuel, fertilizer, and irrigation pumping (2000-04 avg) and long-run planning prices.
[2] All other costs and crop prices are the same as in base scenario (yields vary with fertilizer and irrigation costs).

Cost change, $/ac	($14.25)	($12.75)	($9.36)	($4.74)	($12.58)

Management options…

- While crop prices might be alleviating some of the problem, cost control will still be important
- What can producers do in response to the high input prices?
- Choices will center around crop selection and input use (i.e., fertilizer, fuel for machinery and irrigation)

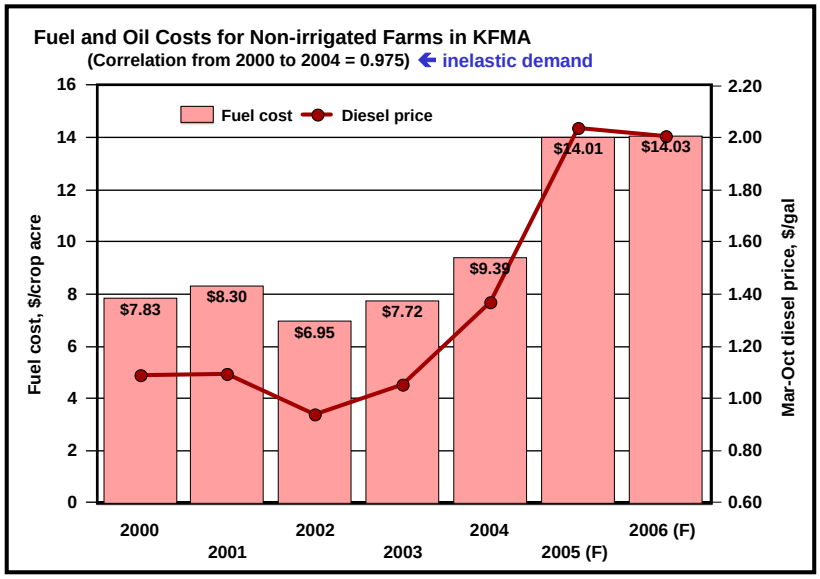
Crop selection…

K-State Crop Budgets as resources

- **Projected budgets – Farm Management Guides**
- **Actual budgets – KFMA Enterprise Analysis**
- ***KSU-CropBudgets2006.xls***
- **All are available on *www.agmanager.info***

www.agmanager.info

Fuel costs per acre versus diesel prices…



Without any change, costs in 2005 & 2006 will be up substantially on average.

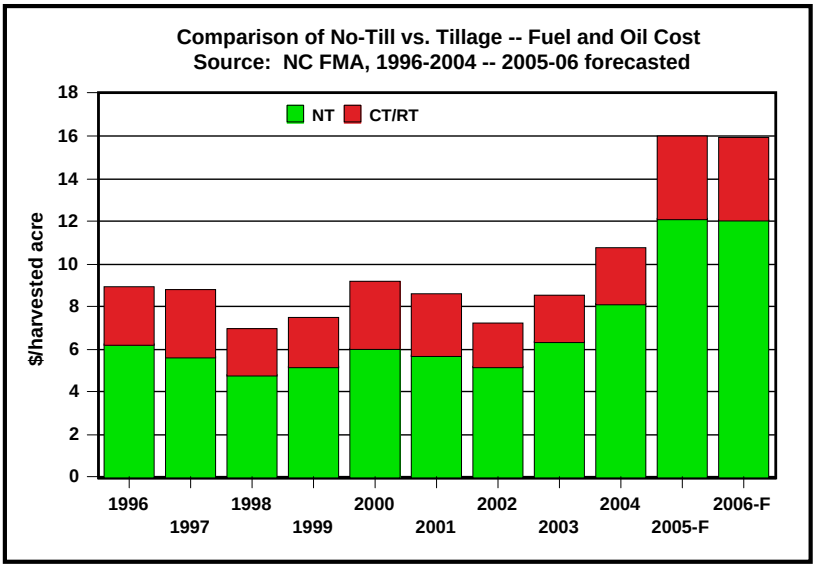
What can producers do is response to higher machinery costs?

Without any change, costs of machinery operations will increase about 7-10% from more "normal" times.

Things to consider…

- Reduce operations?
- Hire custom operators?
- Make sure machinery is properly maintained and used efficiently?
- Pass increased costs on to landowners?
- Nothing?

Fuel-savings benefit of no-till increases at higher prices…



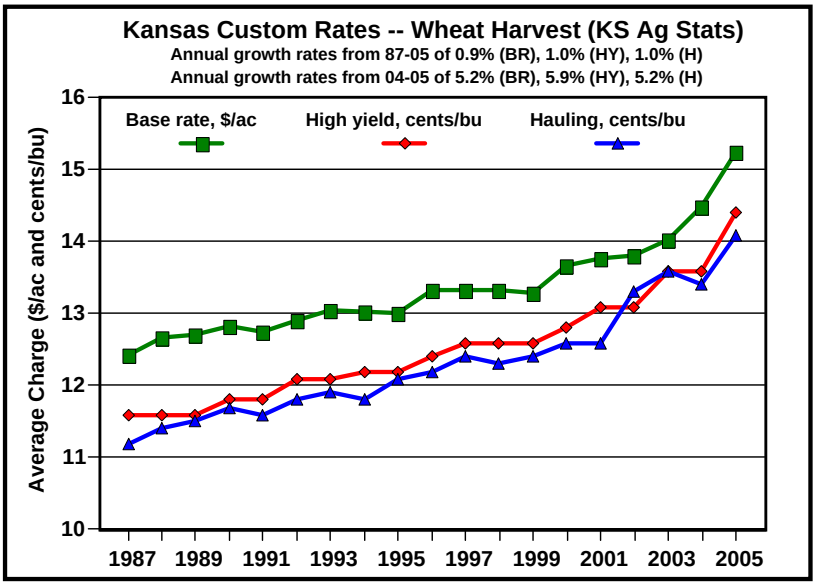
NT fuel generally 67-75% of CT/RT, savings could be as high as $4/acre at current diesel prices…

What can a producer do?

Hiring custom operators likely will not be the answer…

… while some custom operators might not increase their rates, something will likely have to give (quality of work?).

Custom harvesters raised their rates in 2005…



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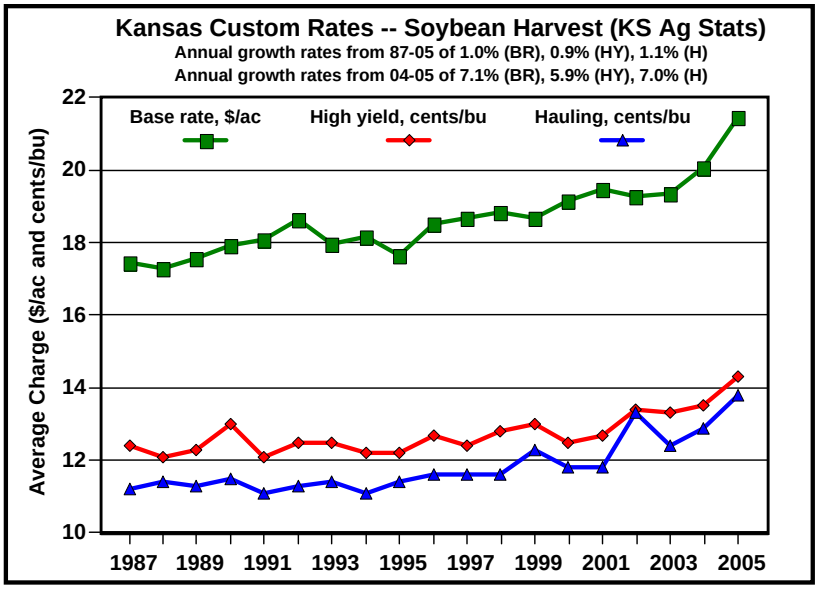
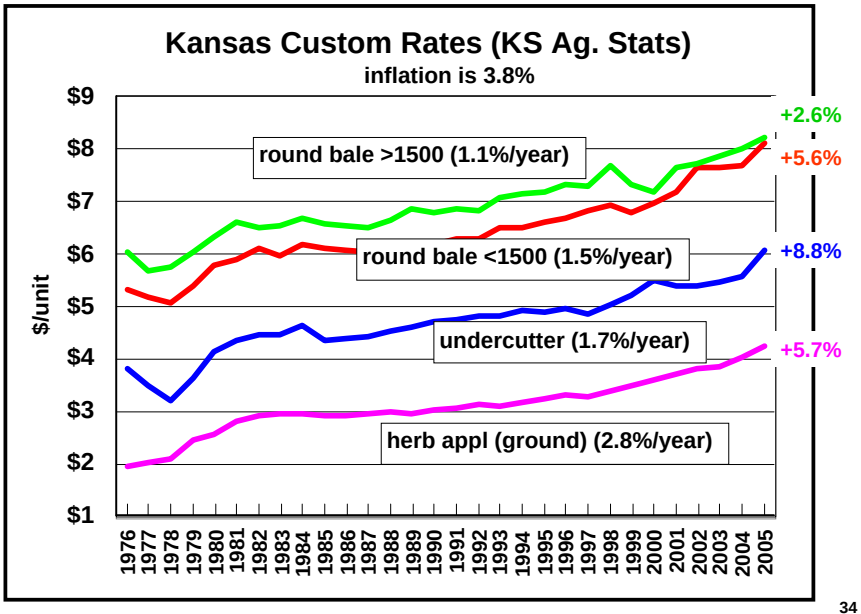


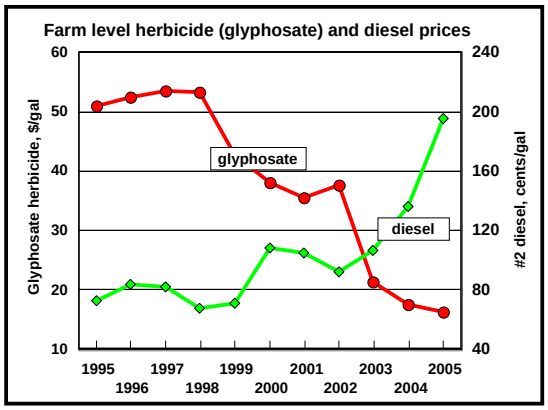
Not all custom rates increased as much in 2005…

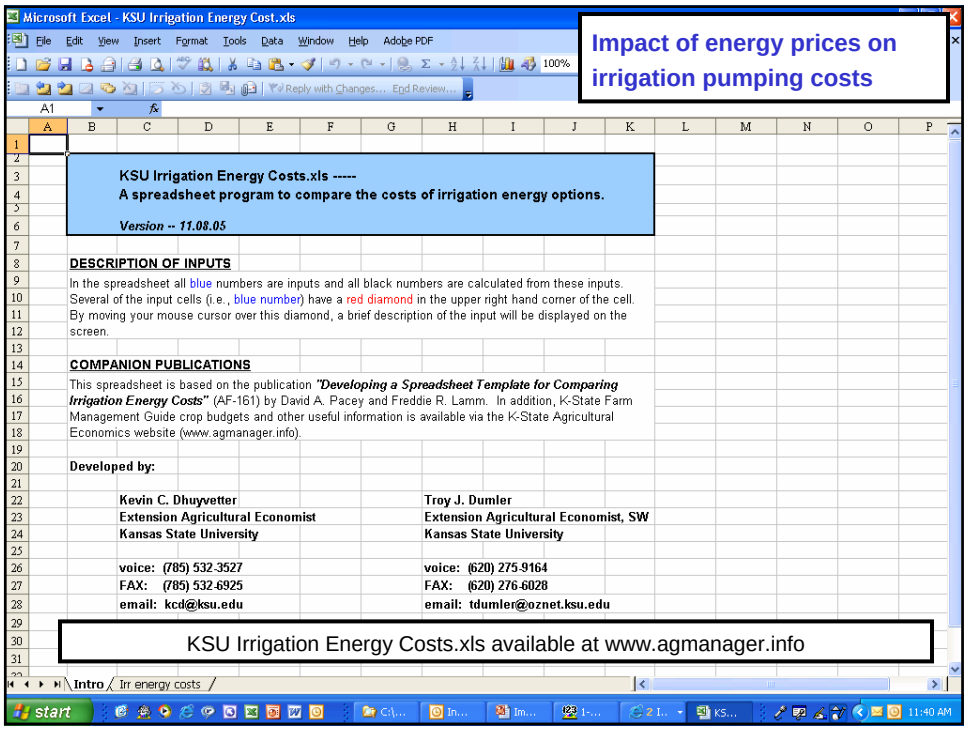


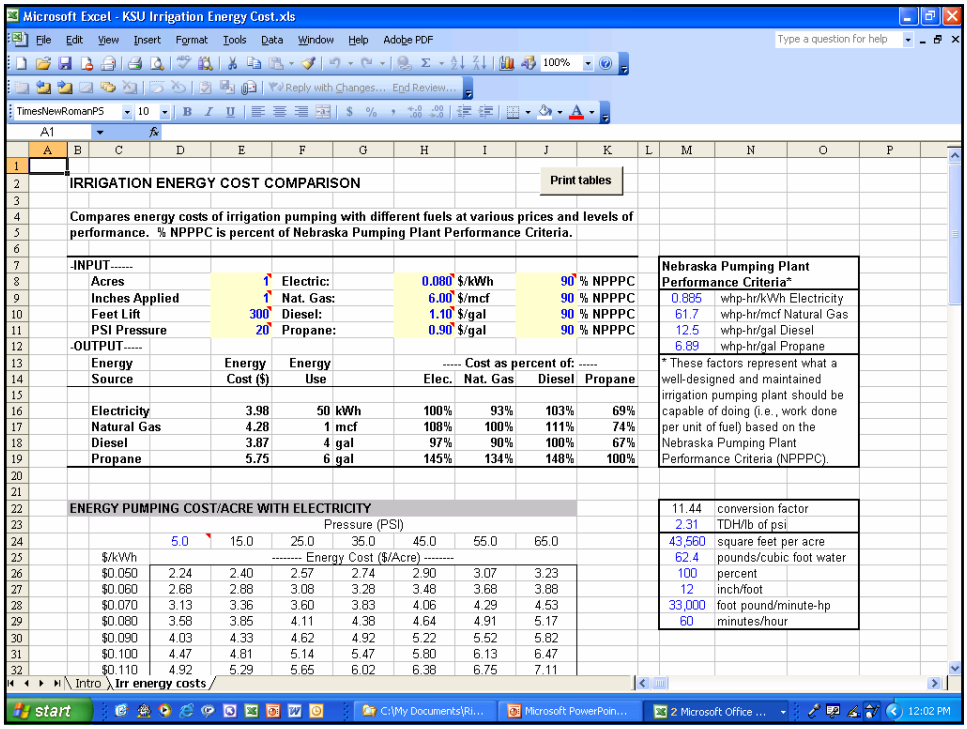
What can a producer do?

- **Benefits of "improved machinery operation" will depend on current situation. While benefit for most producers is likely quite small, cost of doing so is also likely small ➔ *Just do it!***

- **If you have been thinking of no-till, but have been reluctant to make the change --- now might be the time to make the switch!**







Irrigation pumping costs versus energy prices (100')…

ENERGY PUMPING COST/ACRE WITH NATURAL GAS

	Pressure (PSI)						
	5.0	15.0	25.0	35.0	45.0	55.0	65.0
$/mcf	-------- Energy Cost ($/Acre) --------						
$4.00	0.92	1.11	1.30	1.49	1.68	1.87	2.06
$5.00	1.15	1.39	1.62	1.86	2.10	2.34	2.58
$6.00	1.38	1.66	1.95	2.24	2.52	2.81	3.09
$7.00	1.61	1.94	2.27	2.61	2.94	3.27	3.61
$8.00	1.84	2.22	2.60	2.98	3.36	3.74	4.12
$9.00	2.07	2.50	2.92	3.35	3.78	4.21	4.64
$10.00	2.30	2.77	3.25	3.73	4.20	4.68	5.15

Based on applying 1.0 inches/acre and a lift of 100 feet

ENERGY PUMPING COST/ACRE WITH DIESEL

	Pressure (PSI)						
	5.0	15.0	25.0	35.0	45.0	55.0	65.0
$/gal	-------- Energy Cost ($/Acre) --------						
$0.75	0.85	1.03	1.20	1.38	1.56	1.73	1.91
$1.00	1.13	1.37	1.60	1.84	2.07	2.31	2.54
$1.25	1.42	1.71	2.01	2.30	2.59	2.89	3.18
$1.50	1.70	2.05	2.41	2.76	3.11	3.46	3.82
$1.75	1.99	2.40	2.81	3.22	3.63	4.04	4.45
$2.00	2.27	2.74	3.21	3.68	4.15	4.62	5.09
$2.25	2.55	3.08	3.61	4.14	4.67	5.19	5.72

Based on applying 1.0 inches/acre and a lift of 100 feet

Irrigation pumping costs versus energy prices (300')…

ENERGY PUMPING COST/ACRE WITH NATURAL GAS

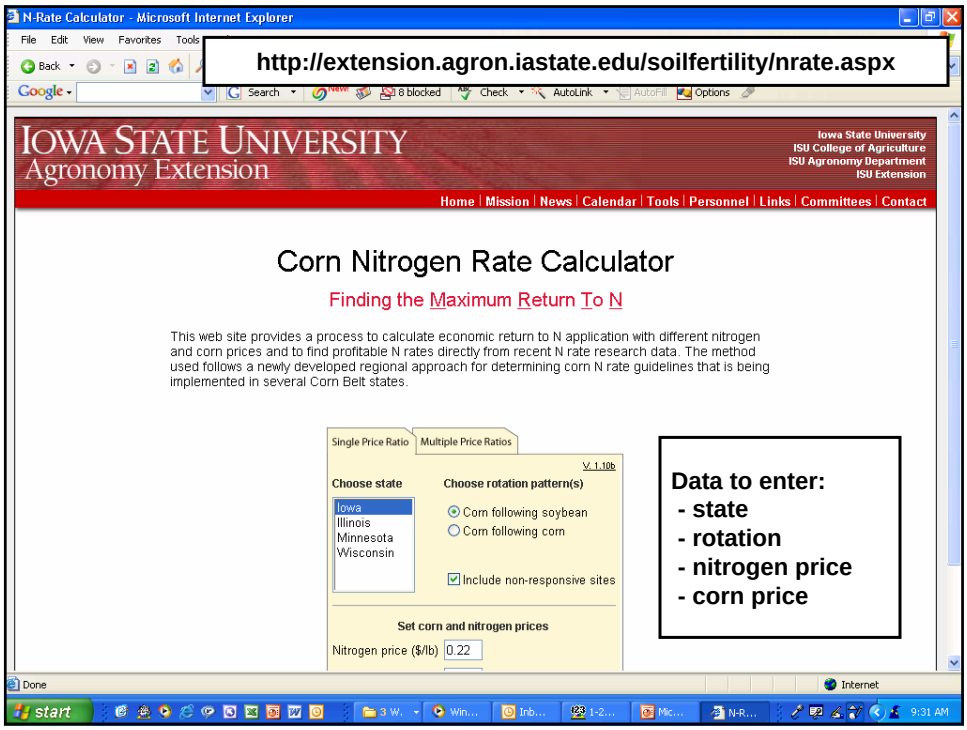
	Pressure (PSI)						
	5.0	15.0	25.0	35.0	45.0	55.0	65.0
$/mcf	-------- Energy Cost ($/Acre) --------						
$4.00	2.57	2.76	2.95	3.14	3.33	3.52	3.71
$5.00	3.21	3.45	3.69	3.92	4.16	4.40	4.64
$6.00	3.85	4.14	4.42	4.71	4.99	5.28	5.56
$7.00	4.49	4.83	5.16	5.49	5.83	6.16	6.49
$8.00	5.13	5.52	5.90	6.28	6.66	7.04	7.42
$9.00	5.78	6.20	6.63	7.06	7.49	7.92	8.35
$10.00	6.42	6.89	7.37	7.85	8.32	8.80	9.27

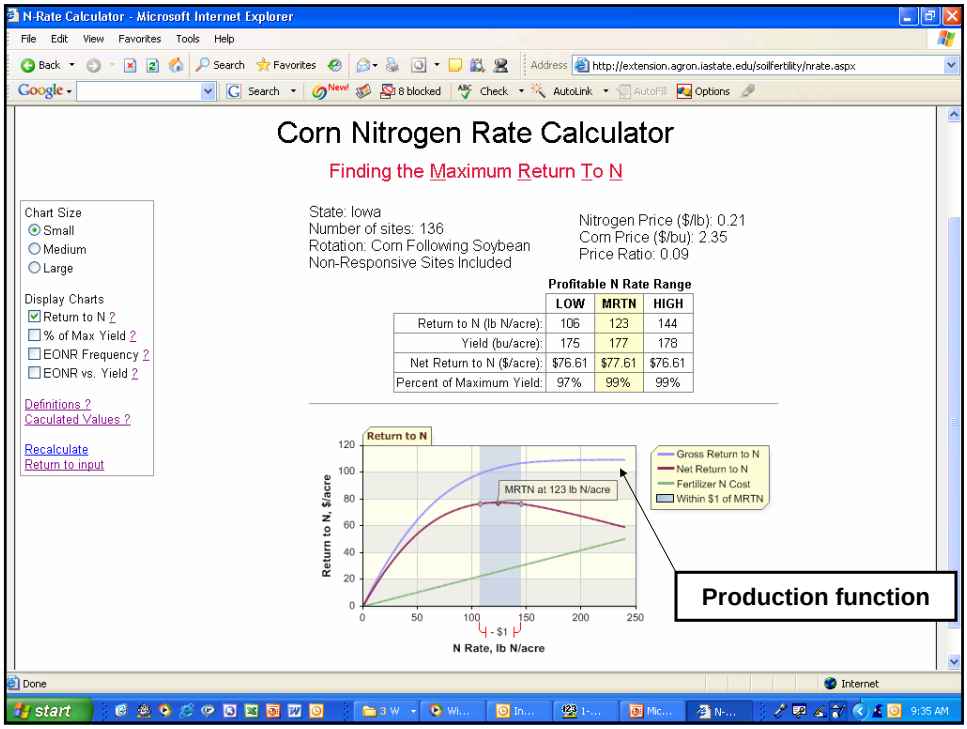
Based on applying 1.0 inches/acre and a lift of 300 feet

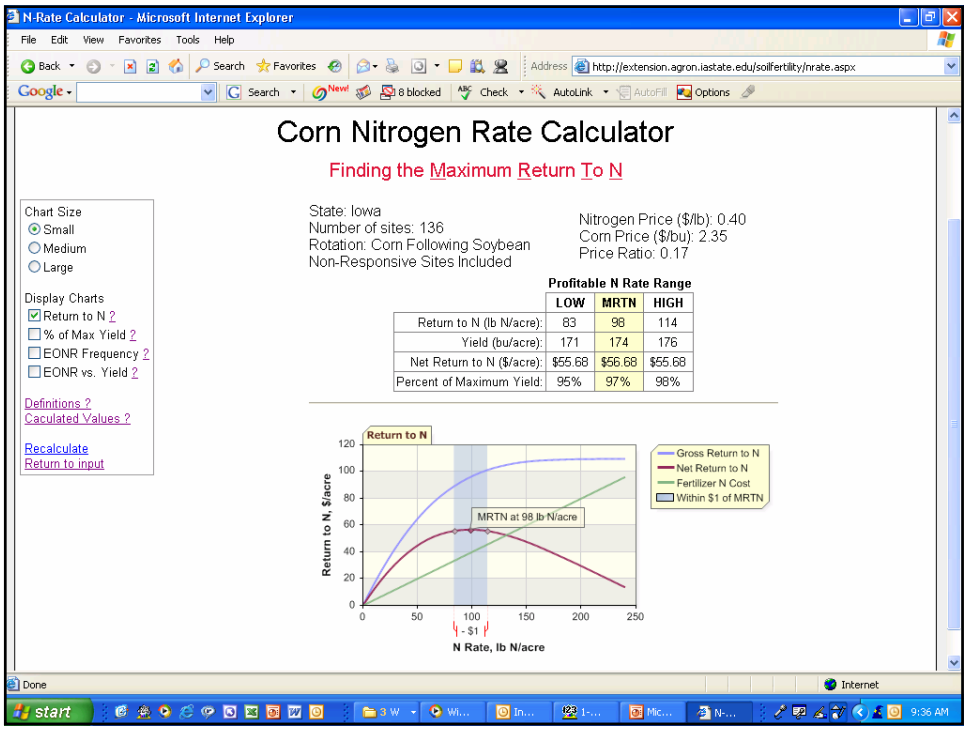
ENERGY PUMPING COST/ACRE WITH DIESEL

	Pressure (PSI)						
	5.0	15.0	25.0	35.0	45.0	55.0	65.0
$/gal	-------- Energy Cost ($/Acre) --------						
$0.75	2.38	2.55	2.73	2.90	3.08	3.26	3.43
$1.00	3.17	3.40	3.64	3.87	4.11	4.34	4.58
$1.25	3.96	4.25	4.55	4.84	5.13	5.43	5.72
$1.50	4.75	5.10	5.46	5.81	6.16	6.51	6.87
$1.75	5.54	5.96	6.37	6.78	7.19	7.60	8.01
$2.00	6.34	6.81	7.28	7.75	8.22	8.69	9.16
$2.25	7.13	7.66	8.19	8.71	9.24	9.77	10.30

Based on applying 1.0 inches/acre and a lift of 300 feet




N-Rate Calculator - Microsoft Internet Explorer
Corn Nitrogen Rate Calculator
Finding the Maximum Return To N
Chart Size
Small
Medium
Large
Display Charts
Return to N ?
% of Max Yield ?
EONR Frequency ?
EONR vs. Yield ?
Definitions ?
Caculated Values ?
Recalculate
Return to input
State: Iowa
Number of sites: 136
Rotation: Corn Following Soybean
Non-Responsive Sites Included
Nitrogen Price ($/lb): 0.21
Corn Price ($/bu): 2.35
Price Ratio: 0.09
Profitable N Rate Range
LOW MRTN HIGH
Return to N (lb N/acre): 106 123 144
Yield (bu/acre): 175 177 178
Net Return to N ($/acre): $76.61 $77.61 $76.61
Percent of Maximum Yield: 97% 99% 99%
Return to N
MRTN at 123 lb N/acre
Gross Return to N
Net Return to N
Fertilizer N Cost
Within $1 of MRTN
Return to N, $/acre
N Rate, lb N/acre
- $1
Production function


N-Rate Calculator - Microsoft Internet Explorer
Corn Nitrogen Rate Calculator
Finding the Maximum Return To N
Chart Size
Small
Medium
Large
Display Charts
Return to N ?
% of Max Yield ?
EONR Frequency ?
EONR vs. Yield ?
Definitions ?
Caculated Values ?
Recalculate
Return to input
State: Iowa
Number of sites: 136
Rotation: Corn Following Soybean
Non-Responsive Sites Included
Nitrogen Price ($/lb): 0.40
Corn Price ($/bu): 2.35
Price Ratio: 0.17
Profitable N Rate Range
LOW MRTN HIGH
Return to N (lb N/acre): 83 98 114
Yield (bu/acre): 171 174 176
Net Return to N ($/acre): $55.68 $56.68 $55.68
Percent of Maximum Yield: 95% 97% 98%
Return to N
MRTN at 98 lb N/acre
Gross Return to N
Net Return to N
Fertilizer N Cost
Within $1 of MRTN
Return to N, $/acre
N Rate, lb N/acre
- $1

KSU nitrogen recommendations…

Corn and grain sorghum

N rec = (Yield Goal x 1.6) – (%SOM x 20) – Profile N – Manure N – Other N Adjustments
+ Previous Crop Adjustments

Wheat

N rec = (Yield Goal x 2.4) – (%SOM x 10) – Profile N – Manure N – Other N Adjustments
+ Previous Crop Adjustments + Tillage Adjustments + Grazing Adjustments

Sunflowers

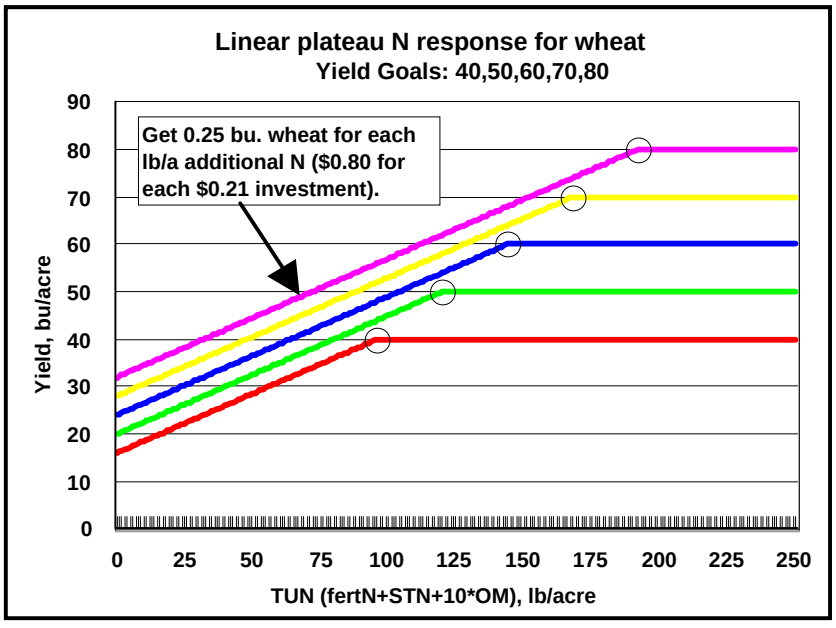
N rec = (Yield Goal x 0.075) – (%SOM x 20) – Profile N – Manure N – Other N Adjustments
+ Previous Crop Adjustments

KSU nitrogen recommendations vs. N price

- Recommendations do not explicitly include prices
- Mathematical relationship between expected yield and nitrogen (i.e., production function) is needed in order to adjust recommendations for prices
- Similar issues pertain to P & K recommendations (i.e., no way to adjust them for prices)
- We assume KSU had in mind these prices:
  - Wheat $3.20/bu
  - Corn $2.35/bu
  - fertN $0.21/lb N

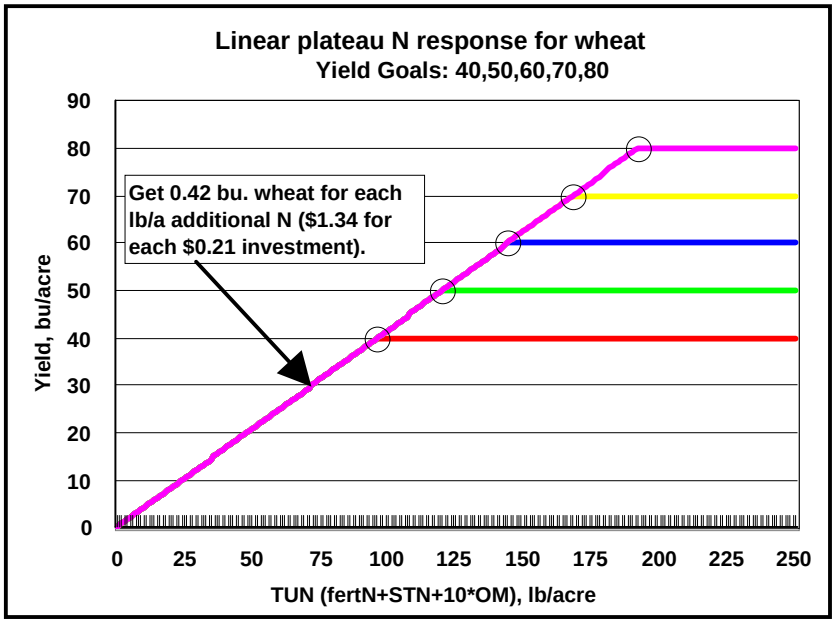
Nitrogen production function…

- In a limiting factor framework, it is generally believed that relationship between N and yield is linear for any given year and location (implies linear plateau production function)
- Linear plateau production function implies that optimal N will either be 0 or level where yield plateaus



Price won't matter until fertN = $0.80/lb, then optimal is 0 lb/acre

Functions could and likely should have 0-intercept if response is to total N



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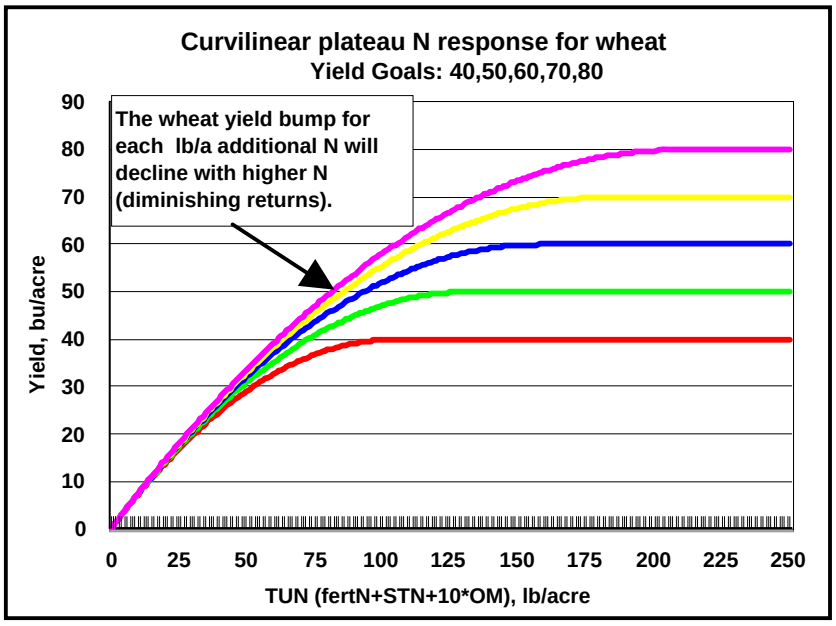
Functions might be curvilinear



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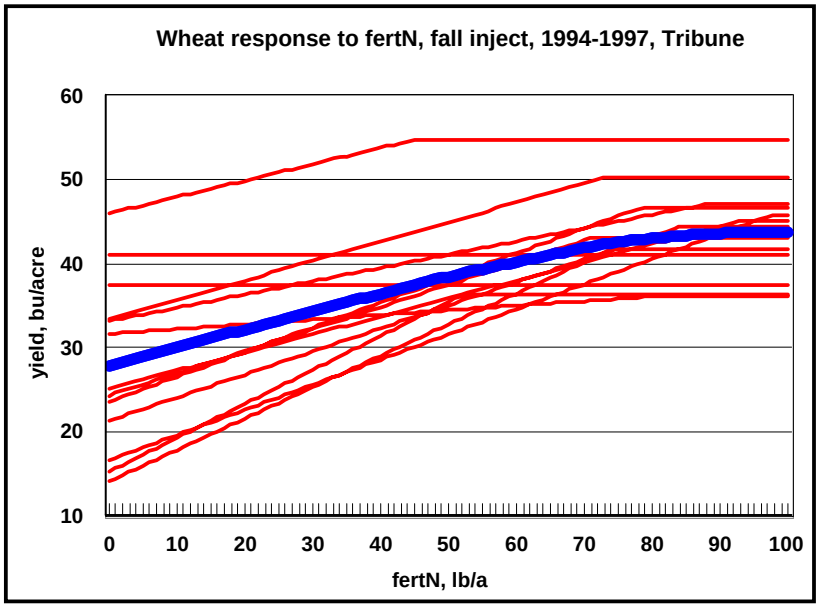
Fertilizer N research in late 2005
Kastens, Dhuyvetter, Schlegel, and Dumler

Average of linear plateaus can become non-linear…



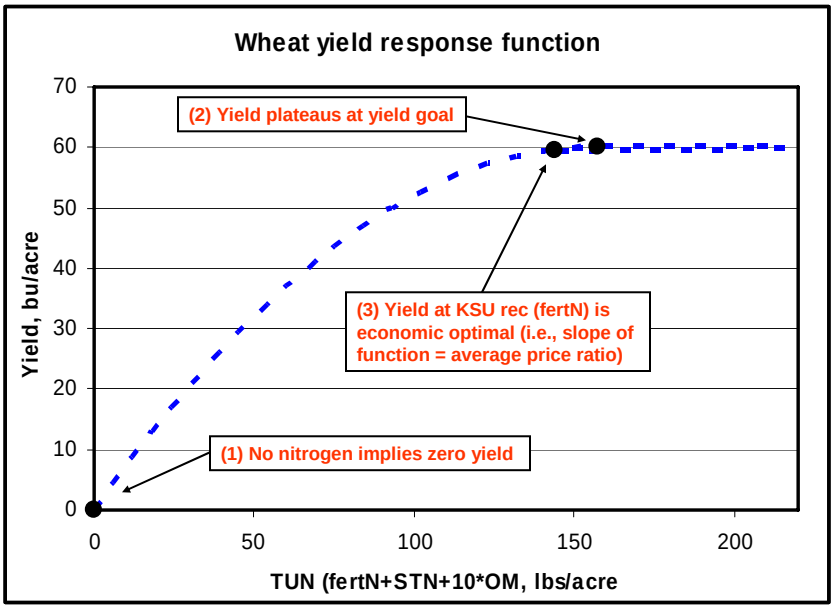
Functional form…

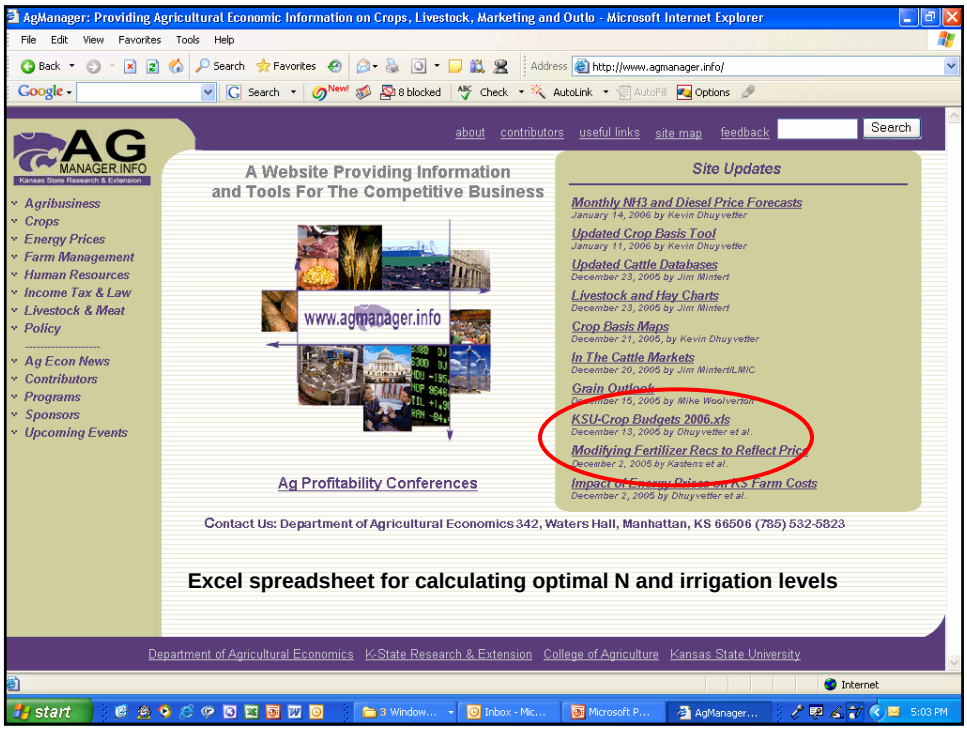
- **Numerous functional forms could be used that would meet objectives. We considered:**
  - Linear plateau, along with four different curvilinear forms
- **Based on nitrogen fertilizer research studies from north central and western Kansas on wheat, corn, and milo, quadratic plateau model fit data better than alternatives most often**

Nitrogen production function…

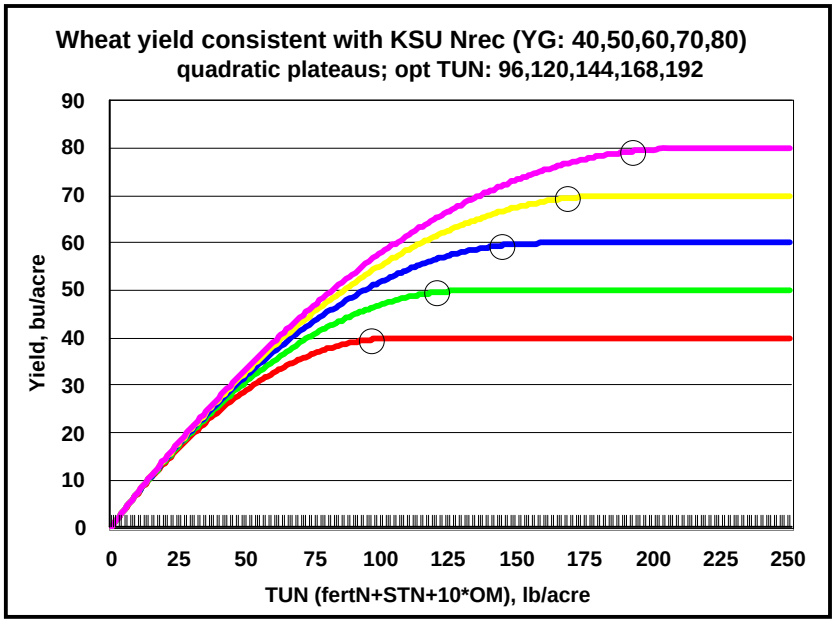
- **Nice property of non-linear production function is that it implies diminishing marginal returns and thus prices matter**
- **Assumed functional form is quadratic plateau which allows diminishing returns – consistent with linear plateau in any given year**
- **Estimate model parameters such that**
  - KSU Nrec is economic optimum at historical average prices
  - Yield plateau is equal to yield goal
  - Intercept goes through origin (i.e., 0 N equates to 0 yield)

Defined points that allowed quadratic-plateau function to be defined…





Same optimal N (slope there = 0.21/3.20) but yields about 1% lower than plateau



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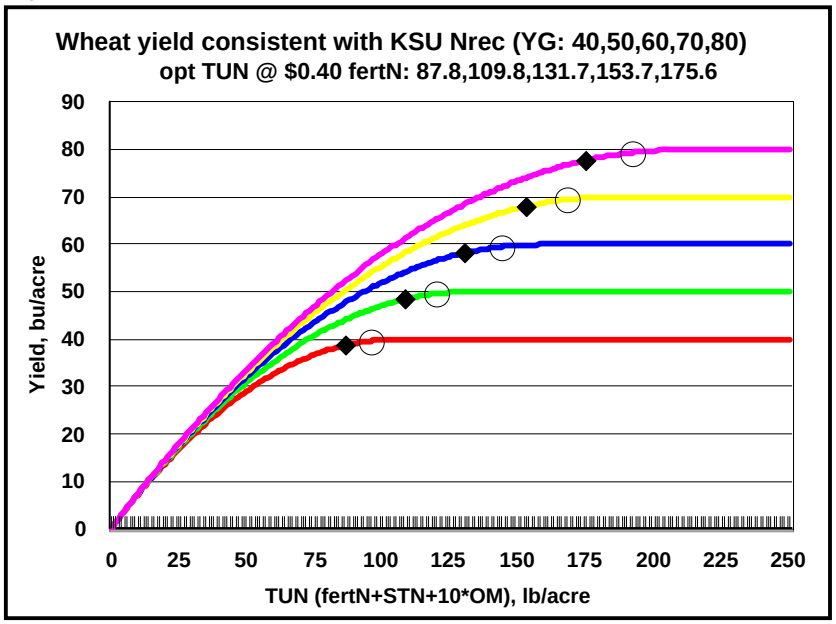
Slope at diamonds is 0.40/3.20



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Dryland optimal fertilizer N values – Long-run N and crop prices

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	75.0%	3.0%	10.0%	12.0%	0.0%
Yield Goal (YG), bu/ac	48.0	80.0	60.0	22.0	1200.0
Enter 0 for Dryland or 1 for Irrigated	0	0	0	0	0
Annual rainfall	28.0	28.0	28.0	28.0	28.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.212	$0.212	$0.212	$0.212	$0.212
Irrigation energy cost, $/inch	$2.220	$2.220	$2.220	$2.220	$2.220
KSU recommended nitrogen, lbs/ac	75.2	68.0	36.0	0.0	30.0
Econ Optimum fertN, lbs/ac	74.1	66.2	34.8	0.0	29.3
Econ Optimum Irrigation Amount, in	0.0	0.0	0.0	0.0	0.0
Yield at optimal N and I, bu/ac	47.6	79.3	59.4	21.3	1192.7
B. Price per unit	$2.93	$2.03	$1.85	$4.96	$0.110

Optimal rates are very close to KSU recommendations because prices are similar to long-term averages

Dryland optimal fertilizer N values – Current N and long-run crop prices

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	75.0%	3.0%	10.0%	12.0%	0.0%
Yield Goal (YG), bu/ac	48.0	80.0	60.0	22.0	1200.0
Enter 0 for Dryland or 1 for Irrigated	0	0	0	0	0
Annual rainfall	28.0	28.0	28.0	28.0	28.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.332	$0.332	$0.332	$0.332	$0.332
Irrigation energy cost, $/inch	$2.220	$2.220	$2.220	$2.220	$2.220
KSU recommended nitrogen, lbs/ac	75.2	68.0	36.0	0.0	30.0
Econ Optimum fertN, lbs/ac	67.3	59.0	28.8	0.0	25.0
Econ Optimum Irrigation Amount, in	0.0	0.0	0.0	0.0	0.0
Yield at optimal N and I, bu/ac	46.9	78.4	58.5	21.3	1182.2
B. Price per unit	$2.93	$2.03	$1.85	$4.96	$0.110

Optimal rates are about 10-15% less than KSU recommendations at high N price

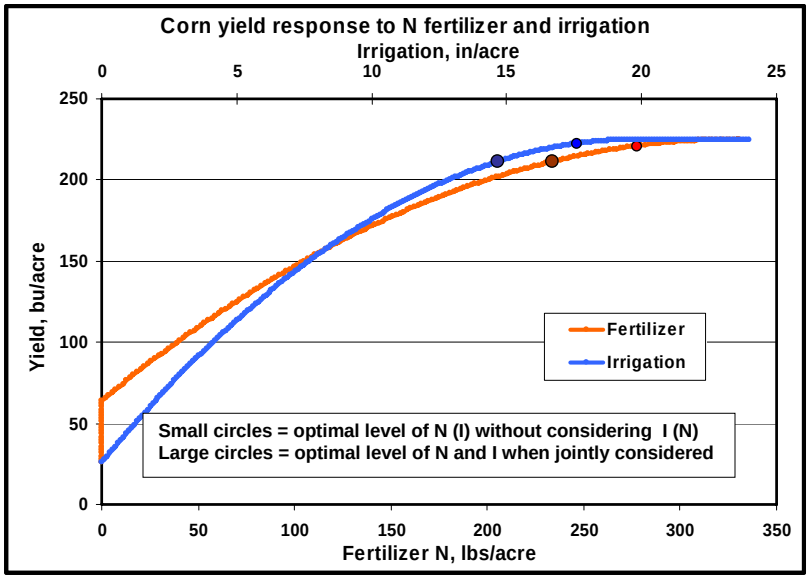
Dryland optimal fertilizer N values – Current N and crop prices

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	75.0%	3.0%	10.0%	12.0%	0.0%
Yield Goal (YG), bu/ac	48.0	80.0	60.0	22.0	1200.0
Enter 0 for Dryland or 1 for Irrigated	0	0	0	0	0
Annual rainfall	28.0	28.0	28.0	28.0	28.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.332	$0.332	$0.332	$0.332	$0.332
Irrigation energy cost, $/inch	$2.220	$2.220	$2.220	$2.220	$2.220
KSU recommended nitrogen, lbs/ac	75.2	68.0	36.0	0.0	30.0
Econ Optimum fertN, lbs/ac	72.7	61.8	31.1	0.0	26.5
Econ Optimum Irrigation Amount, in	0.0	0.0	0.0	0.0	0.0
Yield at optimal N and I, bu/ac	47.5	78.8	58.9	21.3	1186.2
B. Price per unit	$4.12	$2.35	$2.14	$5.60	$0.125

Optimal rates vary crop by crop due to N/crop price relationship

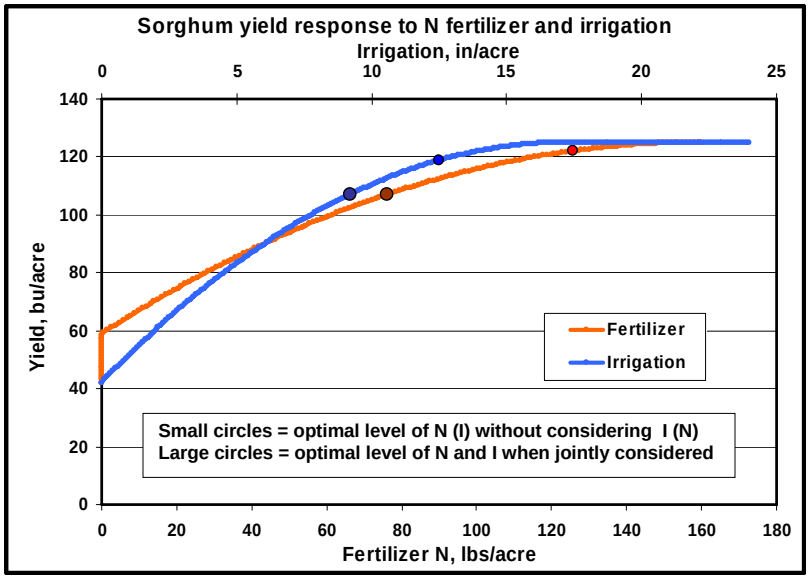
Extensions to research:
1) irrigation
2) phosphorus
3) value of soil sampling

When considering irrigation and N together, optimal values decrease significantly…



Corn price = $2.35/bu, N price = $0.40/lb, irrigation cost = $6.50/inch

When considering irrigation and N together, optimal values decrease significantly…



Sorghum price = $2.10/bu, N price = $0.40/lb, irrigation cost = $6.50/inch

Irrigated optimal fertilizer N values @ $0.21/lb N & $3.10/in

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	24.0%	49.0%	7.5%	6.0%	1.0%
Yield Goal (YG), bu/ac	75.0	225.0	125.0	65.0	2800.0
Enter 0 for Dryland or 1 for Irrigated	1	1	1	1	1
Annual rainfall	18.0	18.0	18.0	18.0	18.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.21	$0.21	$0.21	$0.21	$0.21
Irrigation energy cost, $/inch	$3.10	$3.10	$3.10	$3.10	$3.10
KSU recommended nitrogen, lbs/ac	140.0	300.0	140.0	0.0	150.0
Econ Optimum fertN, lbs/ac	112.3	278.3	113.5	0.0	124.6
Econ Optimum Irrigation Amount, in	12.6	17.1	12.8	16.6	15.0
Yield at optimal N and I, bu/ac	71.1	221.0	119.5	58.5	2706.4

Optimal rates are below KSU recommendations because of irrigation

Irrigated optimal fertilizer N values @ $0.40/lb N & $3.10/in

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	24.0%	49.0%	7.5%	6.0%	1.0%
Yield Goal (YG), bu/ac	75.0	225.0	125.0	65.0	2800.0
Enter 0 for Dryland or 1 for Irrigated	1	1	1	1	1
Annual rainfall	18.0	18.0	18.0	18.0	18.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.40	$0.40	$0.40	$0.40	$0.40
Irrigation energy cost, $/inch	$3.10	$3.10	$3.10	$3.10	$3.10
KSU recommended nitrogen, lbs/ac	140.0	300.0	140.0	0.0	150.0
Econ Optimum fertN, lbs/ac	96.7	250.7	95.9	0.0	110.3
Econ Optimum Irrigation Amount, in	10.9	15.6	11.1	16.6	13.5
Yield at optimal N and I, bu/ac	68.0	215.6	114.5	58.5	2630.3

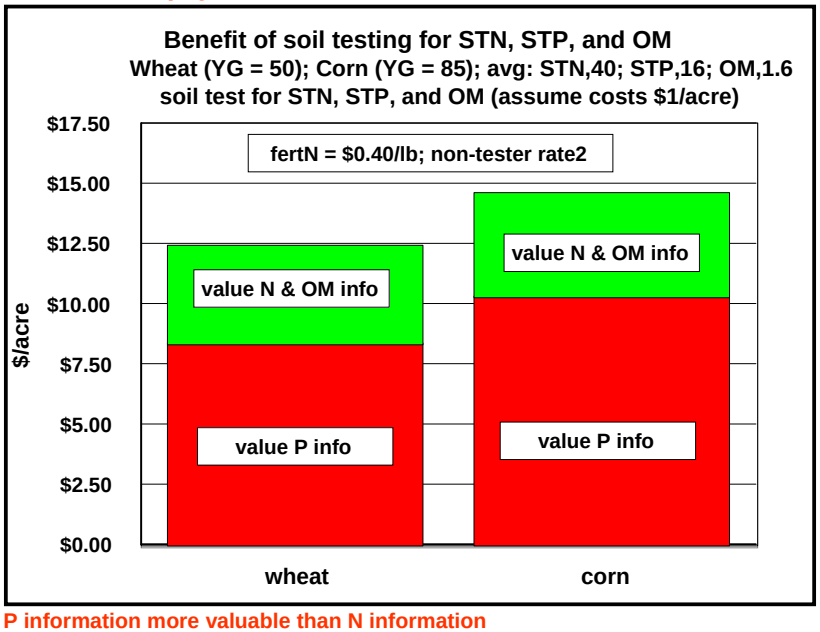
Optimal rates decrease 10-15% at high N price

Irrigated optimal fertilizer N values @ $0.40/lb N & $6.50/in

Comparison of Crop Returns with Nitrogen Fertilizer and Irrigation Water at Economic Optimum Levels					
Crop/System	Wheat	Corn	Sorghum	Soybean	Sunflower
Rotation (1 or 2, if none enter 0)	1	1	1	1	1
Percent of rotation (total - 100%)	24.0%	49.0%	7.5%	6.0%	1.0%
Yield Goal (YG), bu/ac	75.0	225.0	125.0	65.0	2800.0
Enter 0 for Dryland or 1 for Irrigated	1	1	1	1	1
Annual rainfall	18.0	18.0	18.0	18.0	18.0
Organic matter (OM), %	2.00	2.00	2.00	2.00	2.00
Soil test nitrogren (STN), lbs/ac	20.0	20.0	20.0	20.0	20.0
Other N adjustments, lbs/ac	0.0	0.0	0.0	0.0	0.0
Nitrogen fertilizer cost, $/lb	$0.40	$0.40	$0.40	$0.40	$0.40
Irrigation energy cost, $/inch	$6.50	$6.50	$6.50	$6.50	$6.50
KSU recommended nitrogen, lbs/ac	140.0	300.0	140.0	0.0	150.0
Econ Optimum fertN, lbs/ac	66.5	224.9	66.9	0.0	82.7
Econ Optimum Irrigation Amount, in	7.6	14.2	8.3	15.2	10.6
Yield at optimal N and I, bu/ac	59.2	208.6	102.7	58.5	2419.5

At high N and irrigation costs, optimal rates decrease significantly

Soil test – it pays!



P information more valuable than N information

Good cost management will likely be even more valuable with high input prices…