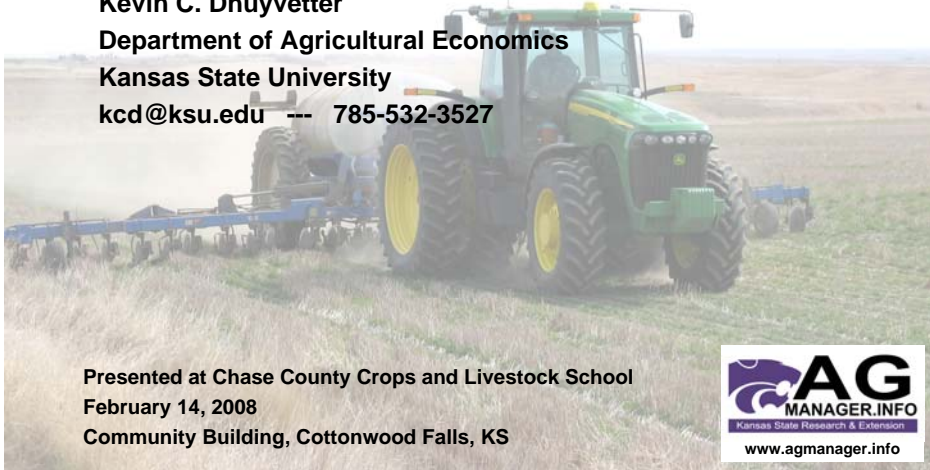


# High Fertilizer Prices – how are they affecting decisions on fertilizer rates?

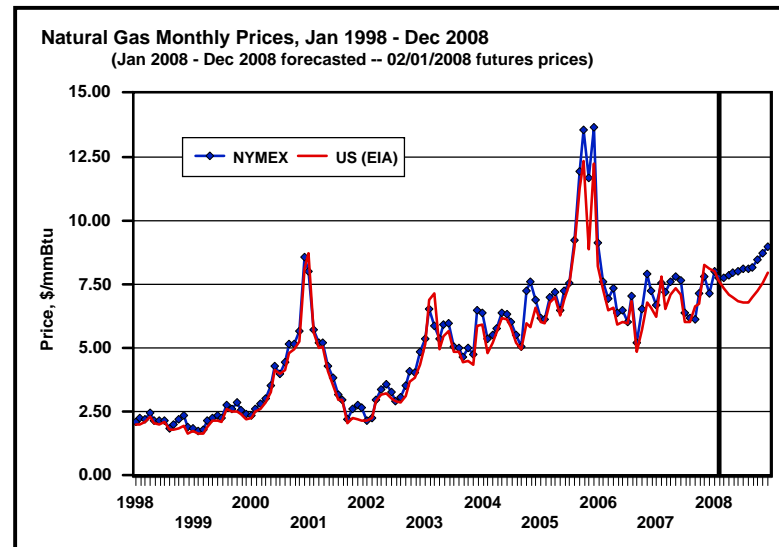
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Presented at Chase County Crops and Livestock School  
 February 14, 2008  
 Community Building, Cottonwood Falls, KS

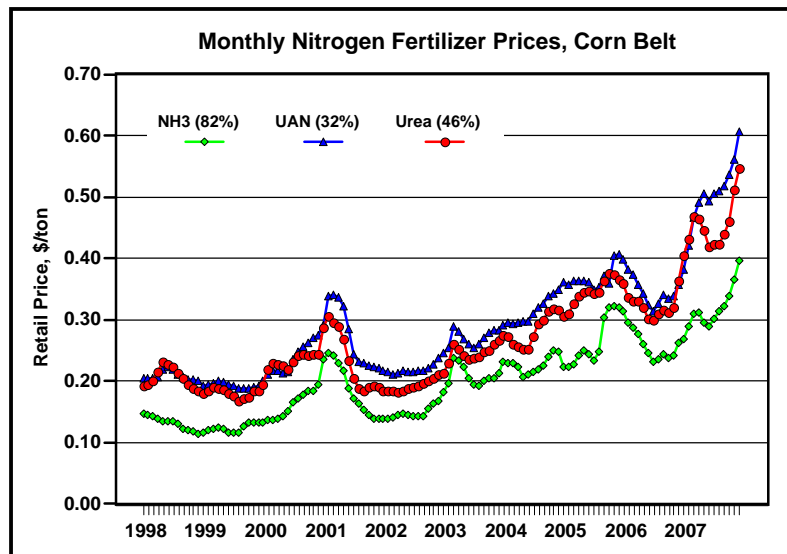


## Natural gas prices are high by long-term standards, but relatively low price compared to crude oil...

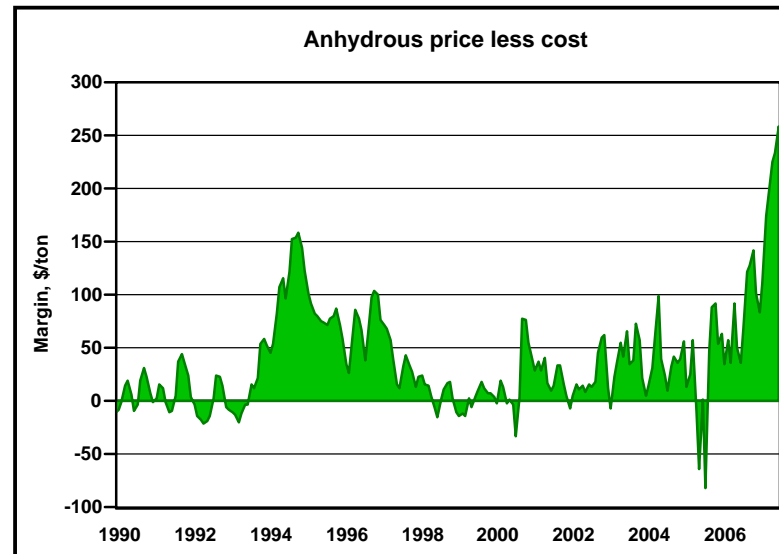


Futures-based forecast based on 2/01/08 closing futures prices

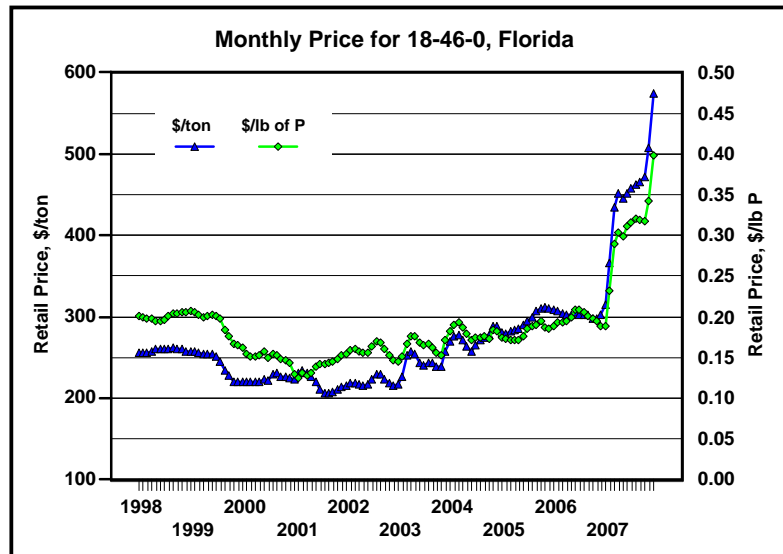
## Nitrogen prices are at all time highs...



## Margins in the nitrogen fertilizer industry are extremely positive in the current environment...



Phosphorus prices are at all time highs...



6

### NYSE's best in 2007

Updated 3d 12h ago | Comment | Recommend

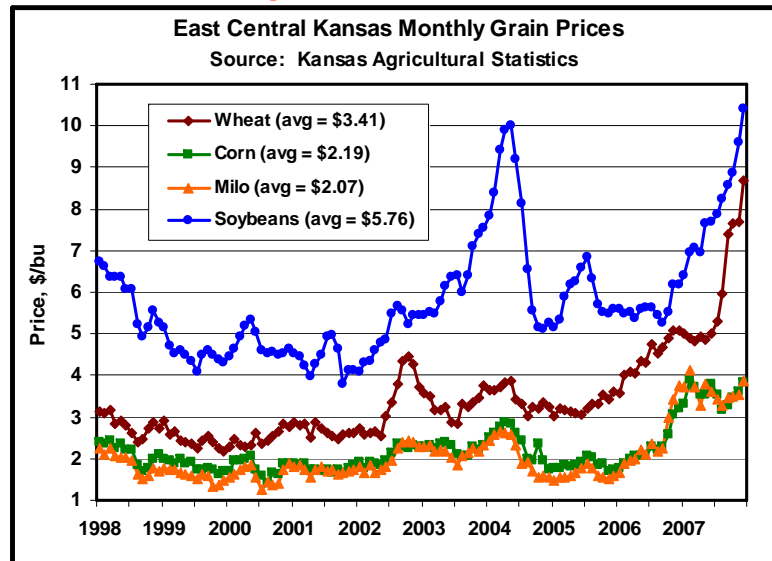
The best-performing stocks on the New York Stock Exchange for the year (more charts):

Company	2007 close	% gain
Mosaic	\$94.34	341.7%
CF Industries Holdings	\$110.06	329.3%
Terra Industries	\$47.76	298.7%
Mechel OAO	\$97.14	281.2%
China Southern Airlines	\$65.45	220.1%
PotashCorp	\$143.96	201.0%
Siderurgica Nacional	\$89.57	198.8%
Trina Solar	\$53.80	184.7%
Excel Maritime Carriers	\$40.19	175.1%
AK Steel Holding	\$46.24	173.6%
Owens Illinois	\$49.50	168.3%
Bally Technologies	\$49.72	166.2%
Vimpel-Communications	\$41.60	163.5%
Chipotle Mexican Grill	\$147.07	158.0%
GraffTech International	\$17.75	156.5%
Calgon Carbon	\$15.89	156.3%
Suntech Power Holdings	\$82.32	142.1%
CNH Global	\$65.82	141.1%
New Oriental Edu&Tchnlgy	\$80.59	140.3%
National Oilwell Varco	\$73.46	140.1%
Yanzhou Coal Mining	\$97.06	139.4%
Jacobs Engineering	\$95.61	134.5%
Aegean Marine Petrol Netwkr	\$38.39	134.1%
McDermott International	\$59.03	132.1%
Agrium	\$72.21	129.3%
Alpha Natural Resources	\$32.48	128.3%

Great year to be in the fertilizer business

7

Fertilizer rates also need to account for grain prices, which are also at all time highs!



8

What do these high prices imply for fertilizer rates?

9

## KSU nitrogen recommendations...

### Corn and grain sorghum

$$\text{N rec} = (\text{Yield Goal} \times 1.6) - (\% \text{SOM} \times 20) - \text{Profile N} - \text{Manure N} - \text{Other N Adjustments} + \text{Previous Crop Adjustments}$$

### Wheat

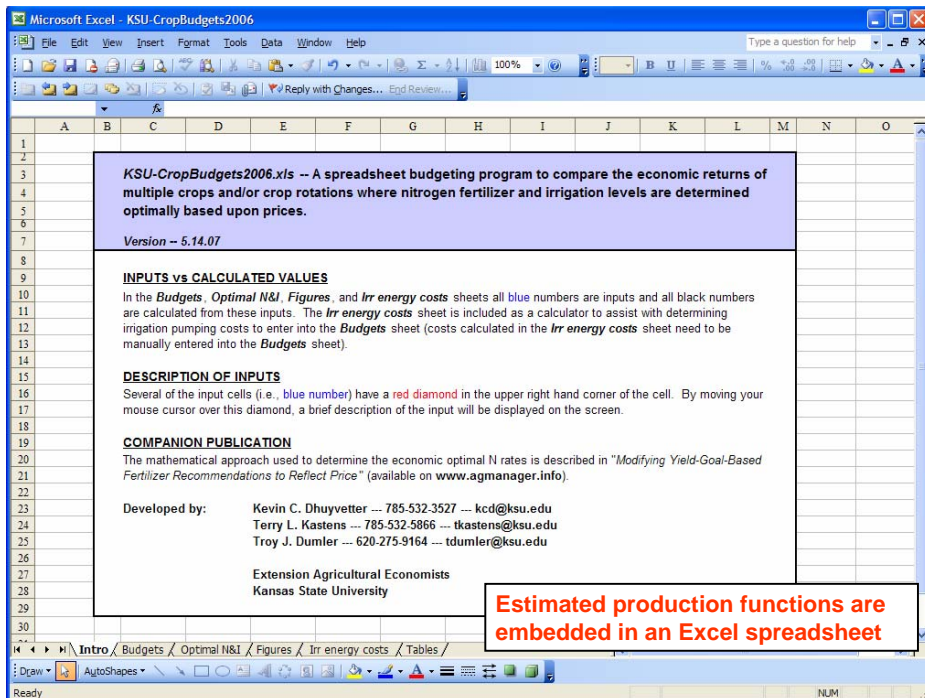
$$\text{N rec} = (\text{Yield Goal} \times 2.4) - (\% \text{SOM} \times 10) - \text{Profile N} - \text{Manure N} - \text{Other N Adjustments} + \text{Previous Crop Adjustments} + \text{Tillage Adjustments} + \text{Grazing Adjustments}$$

### Sunflowers

$$\text{N rec} = (\text{Yield Goal} \times 0.075) - (\% \text{SOM} \times 20) - \text{Profile N} - \text{Manure N} - \text{Other N Adjustments} + \text{Previous Crop Adjustments}$$

## 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)



**KSU-CropBudgets2006.xls** -- A spreadsheet budgeting program to compare the economic returns of multiple crops and/or crop rotations where nitrogen fertilizer and irrigation levels are determined optimally based upon prices.

Version -- 5.14.07

**INPUTS vs. CALCULATED VALUES**  
 In the *Budgets*, *Optimal N&I*, *Figures*, and *Irr energy costs* sheets all blue numbers are inputs and all black numbers are calculated from these inputs. The *Irr energy costs* sheet is included as a calculator to assist with determining irrigation pumping costs to enter into the *Budgets* sheet (costs calculated in the *Irr energy costs* sheet need to be manually entered into the *Budgets* sheet).

**DESCRIPTION OF INPUTS**  
 Several of the input cells (i.e., blue number) have a red diamond in the upper right hand corner of the cell. By moving your mouse cursor over this diamond, a brief description of the input will be displayed on the screen.

**COMPANION PUBLICATION**  
 The mathematical approach used to determine the economic optimal N rates is described in "Modifying Yield-Goal-Based Fertilizer Recommendations to Reflect Price" (available on [www.agmanager.info](http://www.agmanager.info)).

Developed by: Kevin C. Dhuyvetter --- 785-532-3527 --- [kcd@ksu.edu](mailto:kcd@ksu.edu)  
 Terry L. Kastens --- 785-532-5866 --- [tkastens@ksu.edu](mailto:tkastens@ksu.edu)  
 Troy J. Dumler --- 620-275-9164 --- [tdumler@ksu.edu](mailto:tdumler@ksu.edu)

Extension Agricultural Economists  
 Kansas State University

**Estimated production functions are embedded in an Excel spreadsheet**

## How do price-adjusted N rates compare to KSU recommended N rates?

### Nitrogen Recommendations for Wheat

Yield goal, bu/ac	40	50	60	70	80
KSU N rec, lbs/ac	56	80	104	128	152

N price	Price adjusted N rec, lbs/ac				
\$0.40	59	84	108	133	158
\$0.45	58	83	107	132	156
\$0.50	57	82	106	130	155
\$0.55	57	81	105	129	153
\$0.60	56	80	104	128	152

N price	Price adjusted N rec reduction				
\$0.40	-5.2%	-4.6%	-4.2%	-4.0%	-3.8%
\$0.45	-3.8%	-3.4%	-3.1%	-2.9%	-2.8%
\$0.50	-2.5%	-2.2%	-2.0%	-1.9%	-1.8%
\$0.55	-1.1%	-1.0%	-0.9%	-0.9%	-0.8%
\$0.60	0.3%	0.2%	0.2%	0.2%	0.2%

SOM=2.0; STN=20; Wheat price=\$9.00

With high commodity prices you do not want to reduce N rates even though fertilizer prices are extremely high.

## What do these high prices imply for fertilizer rates?

### Nitrogen Recommendations for Corn

Yield goal, bu/ac	60	90	120	150	180
KSU N rec, lbs/ac	36	84	132	180	228

N price	Price adjusted N rec, lbs/ac				
\$0.40	36	85	133	181	229
\$0.45	36	83	131	179	227
\$0.50	35	82	129	176	224
\$0.55	34	80	127	174	221
\$0.60	33	79	125	172	218

N price	Price adjusted N rec reduction				
\$0.40	-1.3%	-0.8%	-0.7%	-0.6%	-0.6%
\$0.45	1.3%	0.9%	0.7%	0.7%	0.6%
\$0.50	4.0%	2.6%	2.2%	2.0%	1.9%
\$0.55	6.6%	4.3%	3.6%	3.3%	3.1%
\$0.60	9.3%	6.0%	5.1%	4.6%	4.4%

SOM=2.0; STN=20; Corn price=\$4.75

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## What do these high prices imply for fertilizer rates?

### Nitrogen Recommendations for Grain Sorghum

Yield goal, bu/ac	50	75	100	125	150
KSU N rec, lbs/ac	20	60	100	140	180

N price	Price adjusted N rec, lbs/ac				
\$0.40	21	61	102	142	183
\$0.45	20	60	100	140	180
\$0.50	19	59	99	138	178
\$0.55	18	58	97	136	175
\$0.60	18	56	95	134	173

N price	Price adjusted N rec reduction				
\$0.40	-4.9%	-2.4%	-2.0%	-1.7%	-1.6%
\$0.45	-0.6%	-0.3%	-0.2%	-0.2%	-0.2%
\$0.50	3.7%	1.8%	1.5%	1.3%	1.2%
\$0.55	8.0%	4.0%	3.2%	2.8%	2.7%
\$0.60	12.3%	6.1%	4.9%	4.4%	4.1%

SOM=2.0; STN=20; Sorghum price=\$4.50

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## Summary ...

- In order to determine how to adjust fertN rates in response to prices, a mathematical relationship between N and yield is needed
- A quadratic-plateau function can be “backed out” of KSU N recs
- Quadratic-plateau function allows diminishing returns, but is also consistent with linear plateau within any site-year
- Even with N prices at historical highs, economic optimal N rates for 2008 dryland crops are nearly identical to KSU N recs due to strong crop prices

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## What is a Fair Grass and Cropland Lease for 2008?

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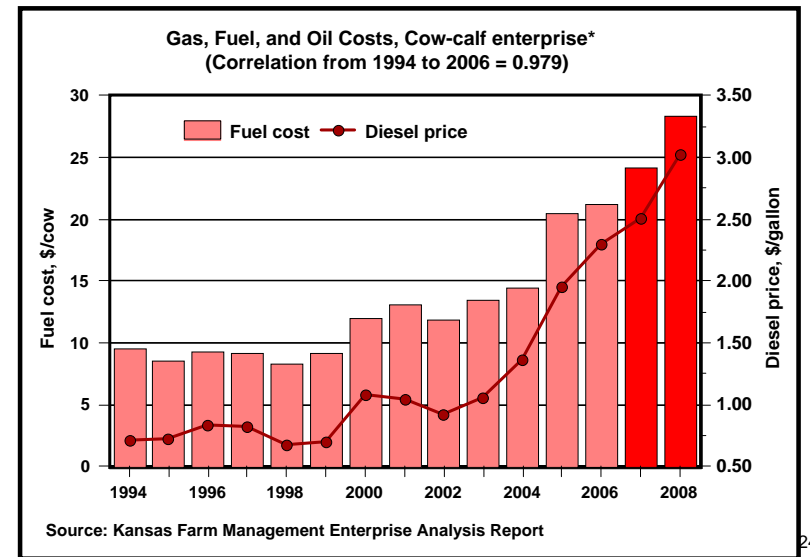
Presented at Chase County Crops and Livestock School  
 February 14, 2008  
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## Pasture rents

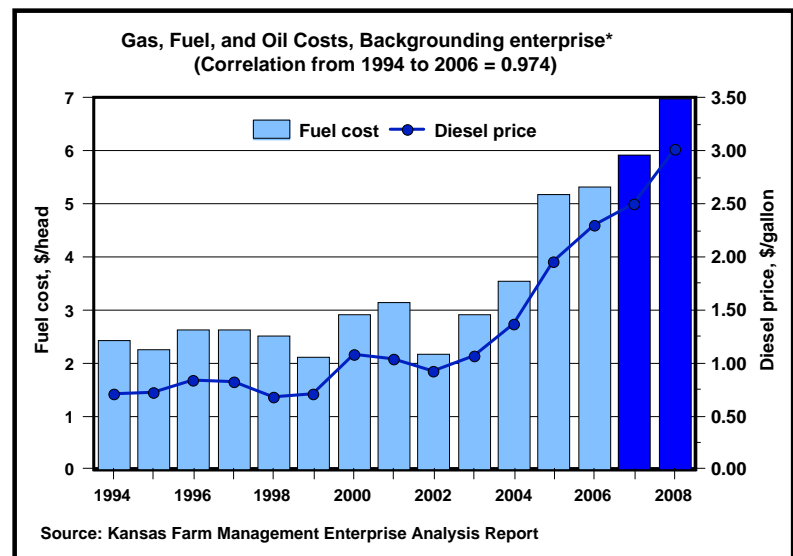
19

## What do high oil and diesel prices mean to the cattleman?



24

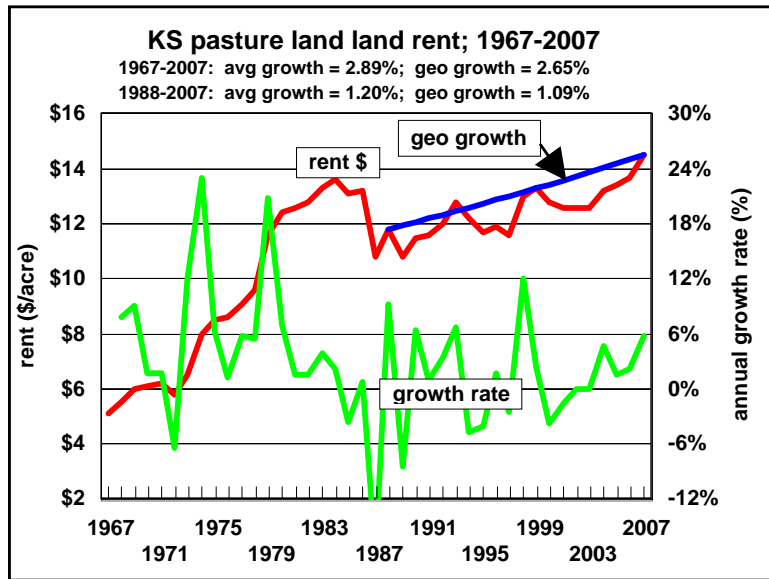
## What do high oil and diesel prices mean to the cattleman?



25

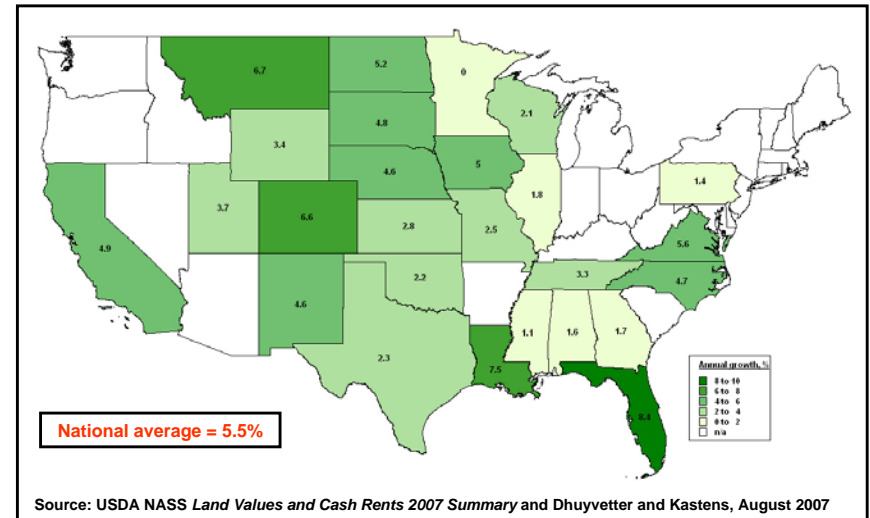
## Impact of high fuel prices on livestock operation costs...

- Inelastic demand → not much can be done to manage higher fuel costs
- While the impact increasing fuel costs have on costs of production cannot be ignored, this might just be the tip of the iceberg...
- Much bigger question is how will high commodity prices (as the result of high energy prices) impact grass rents...



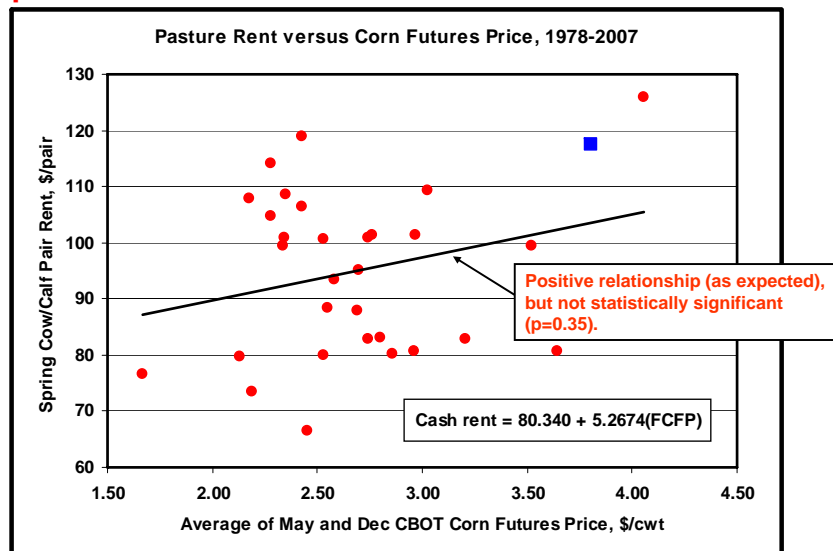
Suggested expected ag growth rate = 2.47% (but if ethanol continues . . . ?) 27

### Pasture Rent Average Annual Growth Rate Jan 1, 2002 to Jan 1, 2007, percent (geo mean)



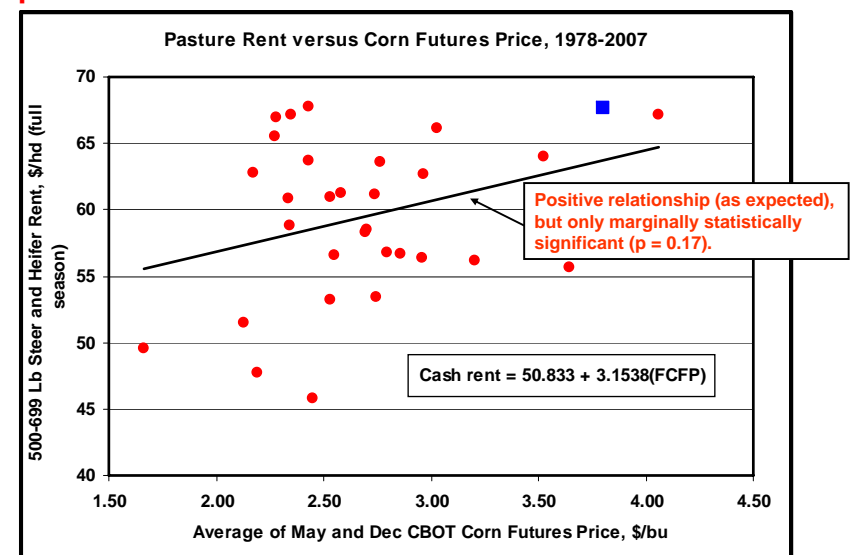
28

### What is the relationship between corn price and pasture rent?



Source: Kansas Ag Statistics *Bluestem Pasture Report* and Dhuyvetter, August 2007 29

### What is the relationship between corn price and pasture rent?



Source: Kansas Ag Statistics *Bluestem Pasture Report* and Dhuyvetter, August 2007 30

## Beef budgets used to estimate feed costs...



Budgets were simply used to calculate feed cost of gain and how it is impacted under various price scenarios to examine relative changes...

31

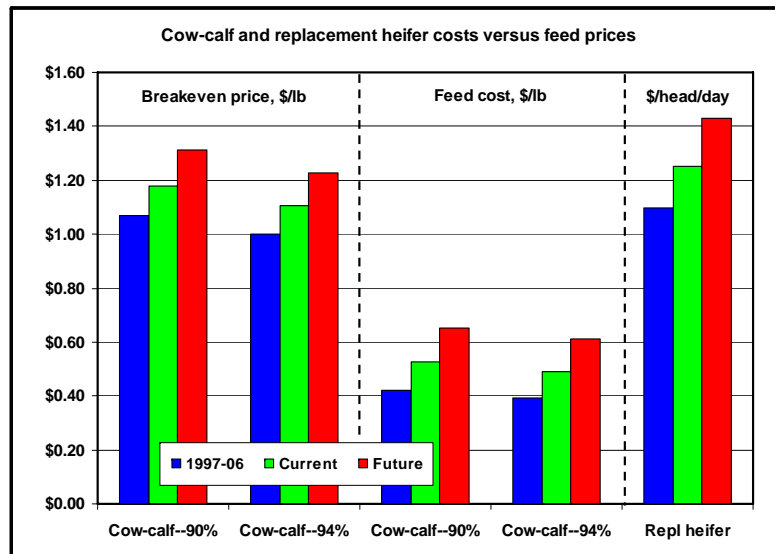
## Budget feed price assumptions...

Feed prices	Unit	10-yr avg (1997-06)	2007	% chg	Future	% chg
Corn	\$/bu	\$2.30	\$3.42	48.8%	\$5.00	46.1%
Grain sorghum	\$/bu	\$2.05	\$3.16	54.2%	\$4.65	47.3%
Supplement	\$/ton	\$177.53	\$224.63	26.5%	\$323.10	43.8%
Sorghum silage	\$/ton	\$14.72	\$21.90	48.8%	\$32.00	46.1%
Alfalfa	\$/ton	\$83.13	\$118.83	42.9%	\$156.25	31.5%
Crop residue	\$/ton	\$12.00	\$16.00	33.3%	\$20.00	25.0%
Prairie hay	\$/ton	\$61.68	\$81.17	31.6%	\$111.33	37.2%
Cane hay	\$/ton	\$39.25	\$58.41	48.8%	\$85.33	46.1%
Pasture charges						
AUM	\$/AUM	\$11.23	\$12.70	13.1%	\$15.24	20.0%
Western KS -- SL	\$/head	\$55.66	\$62.95	13.1%	\$75.54	20.0%
Western KS -- IES	\$/head	\$42.10	\$47.61	13.1%	\$57.13	20.0%
Eastern KS -- SL	\$/head	\$65.49	\$74.06	13.1%	\$88.87	20.0%
Eastern KS -- IES	\$/head	\$49.52	\$56.01	13.1%	\$67.21	20.0%
Wheat grazing	\$/cwt	\$2.00	\$2.40	20.0%	\$2.88	20.0%
Wheat graze-out	\$/cwt	\$2.15	\$2.60	20.9%	\$3.12	20.0%

Percent increase used in 2008 FM Guides

32

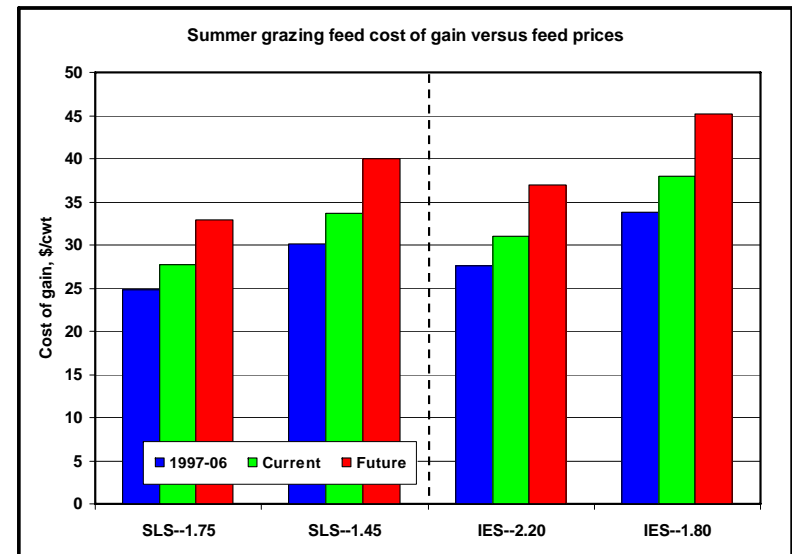
## Breeding enterprises...



Increases (Future vs. 1997-06): BE = 22.6%, Feed cost = 55.2% and \$/hd/day = 32.3%

33

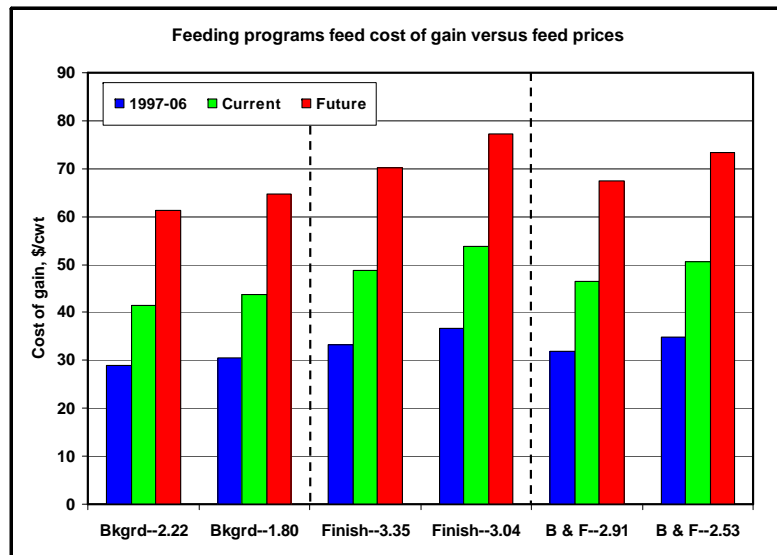
## Summer grazing enterprises...



Increases (Future vs. 1997-06): SLS = 32.8% and IES = 33.1%

34

## Feeding enterprises...



Increases (Future vs. 1997-06): Bkgrd = 111.3%, Finish = 110.7%, and B&F = 110.8%

35

## What does all this mean?

- Feed COG in feeding programs increase over 100% relative to historical time period
- This compares to ~33% for summer grazing programs (based on +120% assumption)
- What do you do about this?
  - Pay less for cattle

36

## What does all this mean?

- Feed COG in feeding programs increase over 100% relative to historical time period
- This compares to ~33% for summer grazing programs (based on +120% assumption)
- What do you do about this?
  - Pay less for cattle
  - Find ways of putting on gain at lower cost
    - Leave cattle on grass longer
    - Background to heavier weights
    - Find alternative feedstuffs

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## Find ways of putting on gain at lower cost...

- How high might grazing rates (summer grass SLS and IES programs) increase?
- Calculated pasture rates such that future feed COG relationships between feeding and grazing programs are similar to historical relationships
- Compared summer grass programs (west and east, SLS and IES) to drylot backgrounding programs
- Across all programs, increasing 2007 pasture rates 94% results in COG for grazing programs, relative to drylot backgrounding, that are proportional to what they were with 1997-2006 prices

38

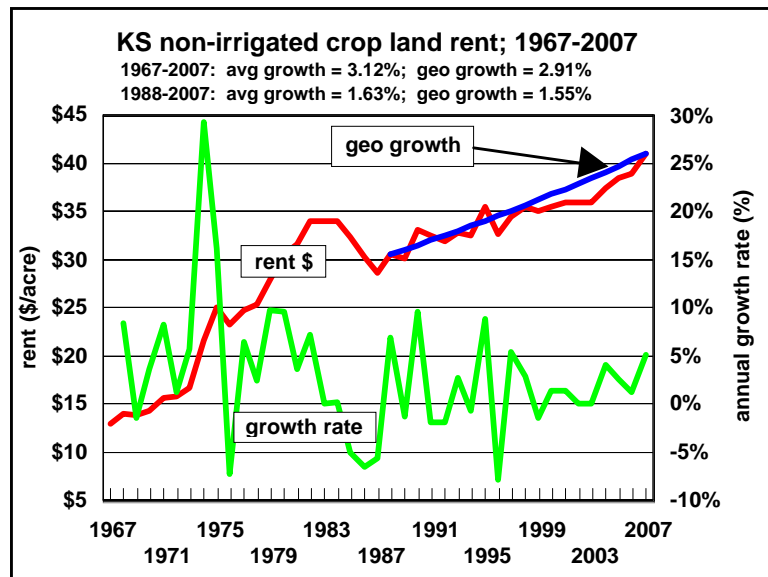
## Cattle Thoughts . . .

- Ethanol is not going away – get used to it
- **AVERAGE** cow-calf profits will be lower
  - Good managers will continue to make money
- **Grass rent will be higher**
  - Still greatly preferred to grain
- **Enterprise (crops vs. cattle) thinking will be especially important**
  - Cropland devoted to grain production?
  - More reliance on grazing native grass?

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## Cropland Rents

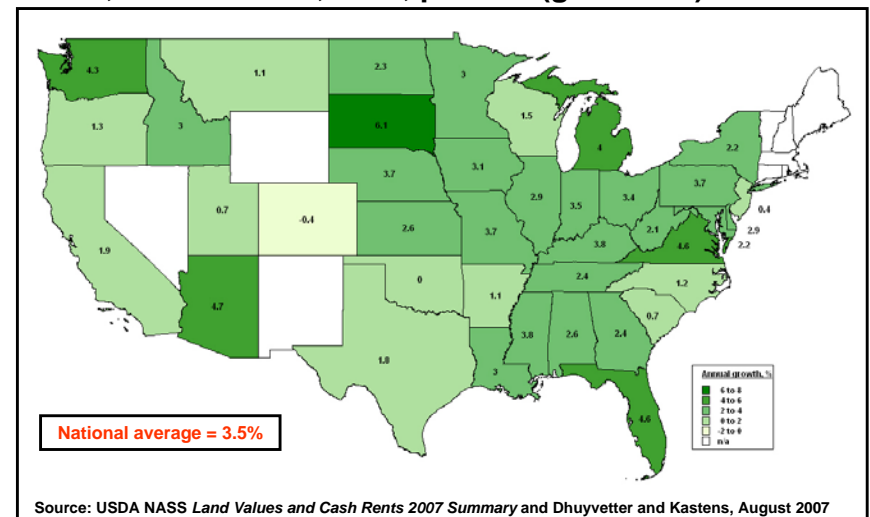
42



Suggested expected ag growth rate = 2.75% (but if ethanol continues . . . ?)

43

## Cropland Rent Average Annual Growth Rate Jan 1, 2002 to Jan 1, 2007, percent (geo mean)

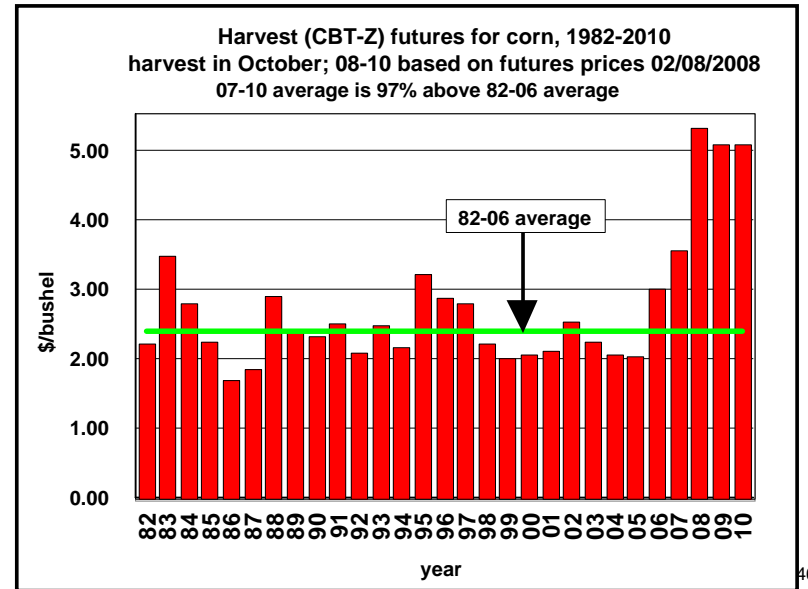


44

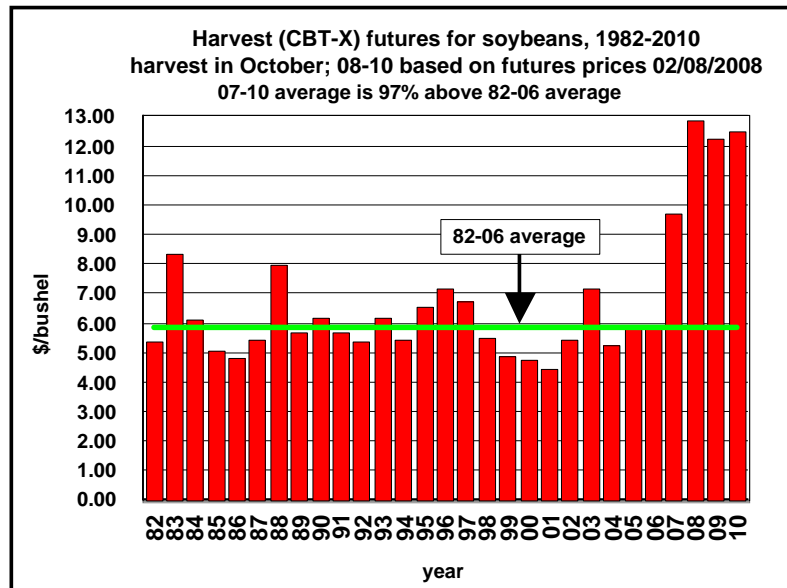
**Result of ethanol push is higher commodity prices**

**Higher crop prices lead to higher cropland rents**

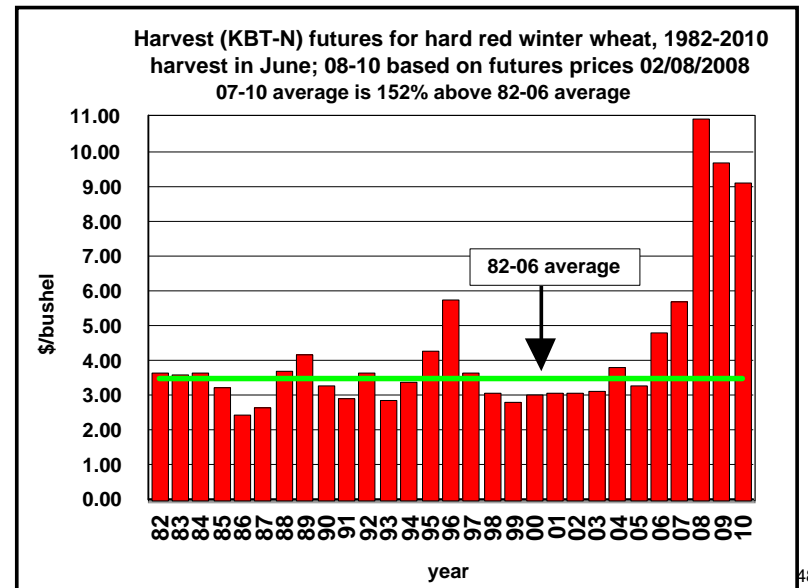
**How long will strong prices stick around?**



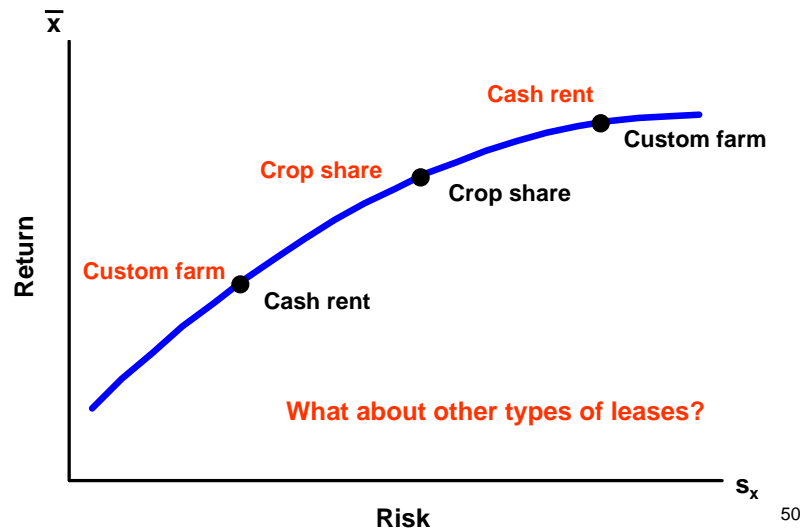
**How long will strong prices stick around?**



**How long will strong prices stick around?**

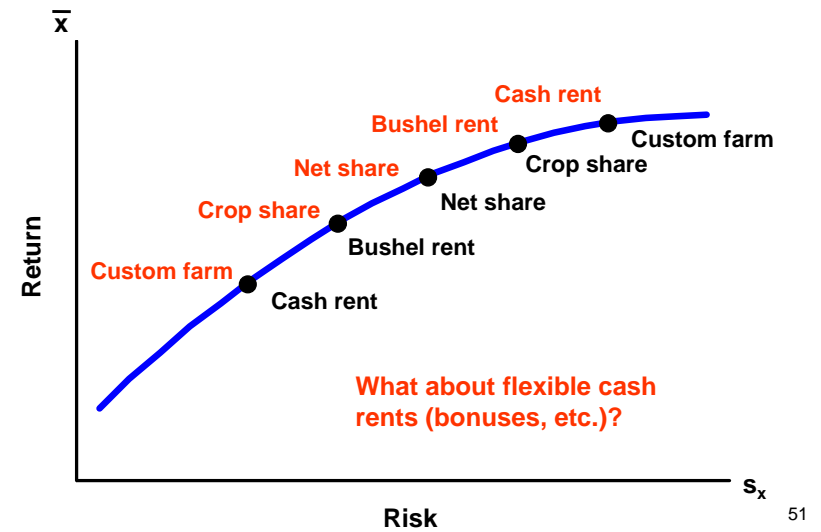


## Landowner/producer risk-return tradeoff



50

## Landowner/producer risk-return tradeoff



51

## KSU study of impact of high commodity prices on rental rates

### Two approaches:

- Crop budgets & KSU-Lease
- Historical relationships

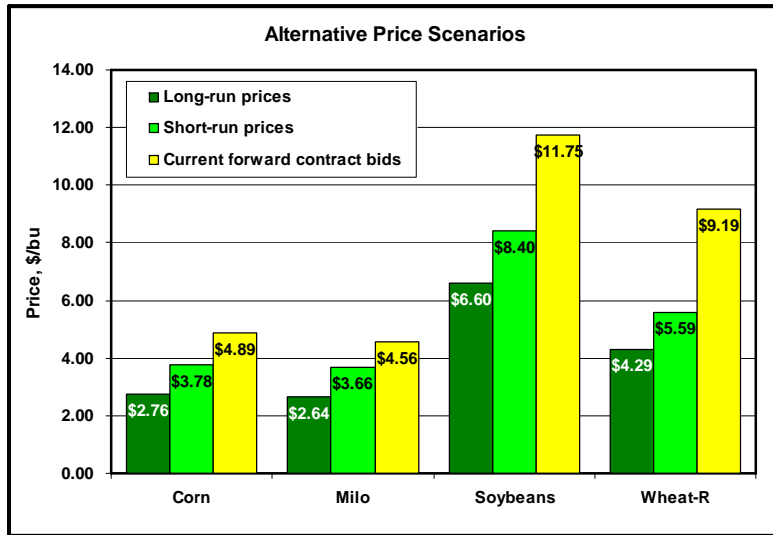
52

## Methods of establishing cash rent values ...

- **Crop share equivalent (adjusted for risk)**
  - Converts equitable crop share rent to an expected dollar amount per acre
- **Landowner's cost**
  - Based on the premise of landowner's continuing to receive comparable returns to what has been received in the past
- **Amount tenant can afford to pay**
  - Residual approach – after tenant pays all expenses, whatever income is left represents cash rent

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### Alternative Prices to Consider for Central Kansas

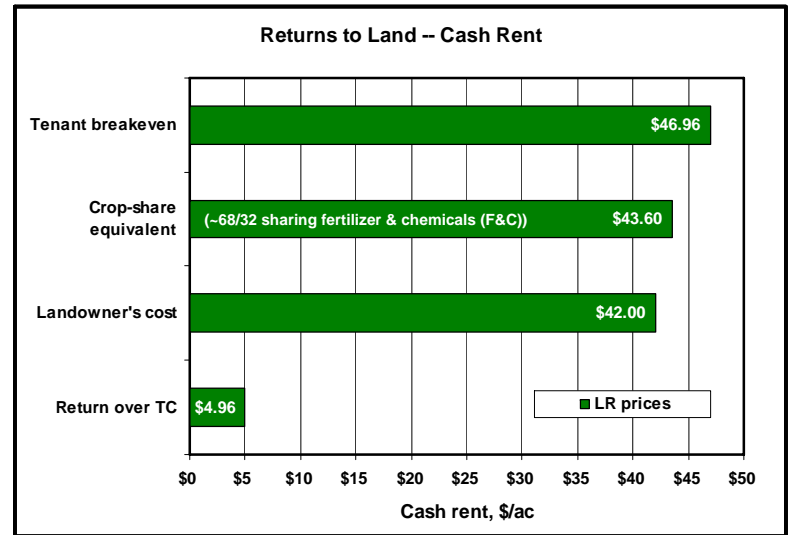


Long-run (08-12) and short-run (08) from MF-1013, current bids from Marian (2/13/08)

55

### Estimated cash rents for Central Kansas

[long run (2008-2012) projected prices]

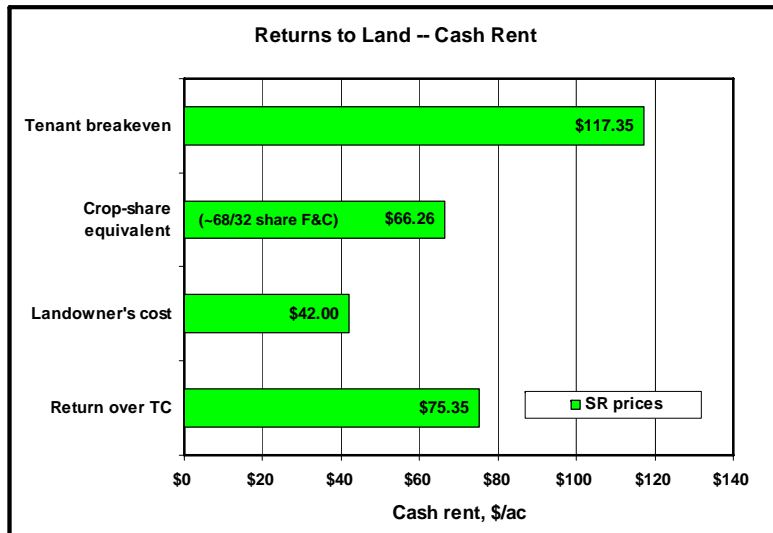


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

56

### Estimated cash rents for Central Kansas

[short-run (2008) projected prices]

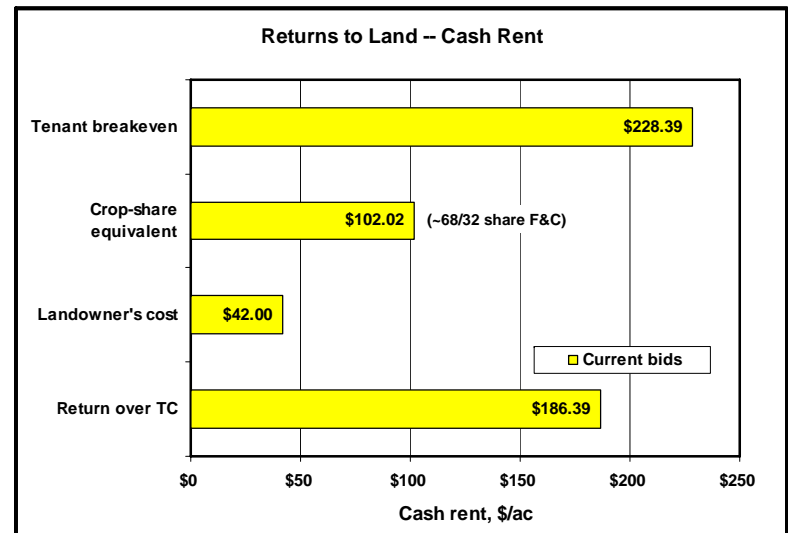


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

57

### Estimated cash rents for Central Kansas

[forward contract bids (2/13/08) for 2008 harvest delivery]

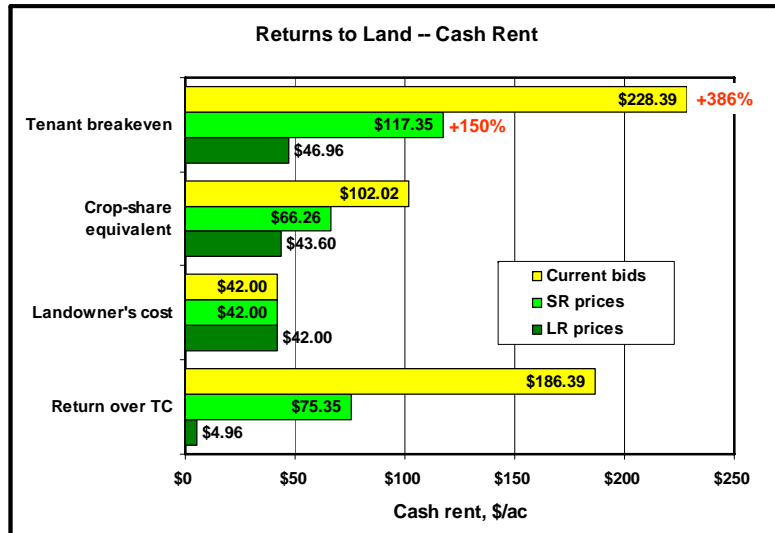


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

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## Estimated cash rents for Central Kansas

(alternative price scenarios)



Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

59

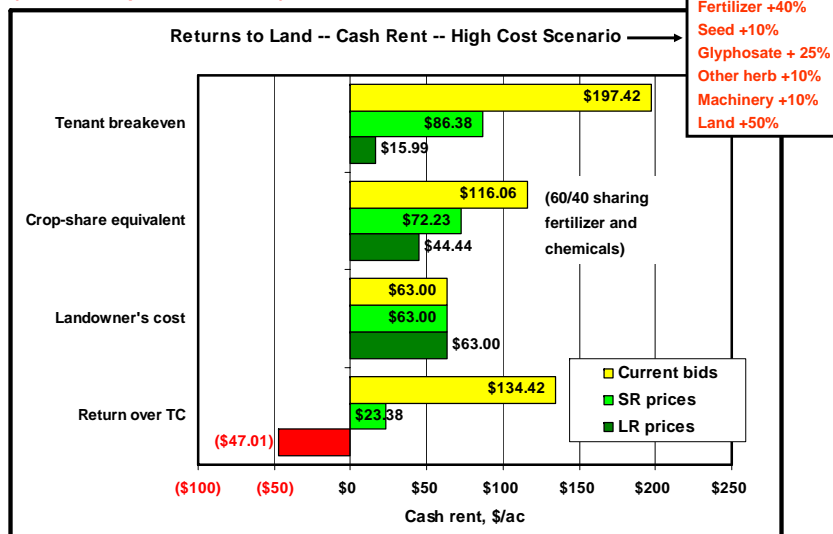
## Really high rent potential . . .

- Previous example suggested that price increases of 35% to 89% could mean a rent increase of 150% to 386% (elasticity of 4.3)
- Will this happen?
- No!
  - Farmers bid up production inputs as they try to increase acres or yield/a to get the high profits:
    - Fertilizer, chemicals, machinery, labor

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## Estimated cash rents for Central Kansas

(alternative price scenarios)



Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

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## A KSU study in January 2008 (Kastens & Dhuyvetter)

state	a 1% change in corn revenue i.e., yield or price, leads to a change of this % in rent	1950-1972 avg rent-to-value ratio (ag cap rate, %)	2007 % of land value due to agriculture	1950-2007 avg ann. growth rate in %, for non-ag land value	1950-2007 avg ann. growth rate in %, for corn yield	1950-2007 avg ann. growth rate in %, for corn price
AR	0.87	8.15	44.12	12.69	3.92	1.45
IA	1.24	7.61	53.43	9.77	2.01	1.46
IL	1.31	6.63	50.03	12.01	1.84	1.54
KS	0.76	7.78	57.98	11.17	3.15	1.58
MO	1.33	8.05	43.56	10.55	2.22	1.47
NE	1.07	8.06	60.37	7.12	2.88	1.51
AL	0.99	8.37	14.51	15.85	2.98	1.67
ND	1.10	9.02	72.51	9.29	3.01	1.57

Notes:

Results don't materially change if use w wheat or soybeans in analysis.  
Most mathematical models explained 85 to 95% of variation in dependent variable.  
Rent/(ag cap rate) equals agricultural portion of land market value.

AL and ND included as examples of high and low non-ag influence

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## Market approach...

Assuming yields continue to grow at historical rates (i.e., 1.4 to 2.5 percent per year) and given current futures market prices, rents would be expected to increase quite substantially (~40 to 60 percent).

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## Closing Thoughts

- Ethanol is inducing higher crop prices and it looks like they'll be around for awhile
- Higher crop prices have the potential to substantially increase rental rates, but rising input costs will temper increases somewhat
- Price volatility will be high in years ahead (without benefit of LDPs), thus fixed cash rents will be risky (potentially to both parties)
- Need for good communications between landowners and tenants is critical in these times

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The screenshot shows a Windows Internet Explorer browser window displaying the website [www.agmanager.info](http://www.agmanager.info). The page features a navigation menu on the left with categories like Agribusiness, Crops, Energy, Farm Management, Human Resources, Income Tax & Law, Livestock & Meat, Policy, Ag Econ News, Contributors, Programs, Sponsors, and Upcoming Events. The main content area includes a header with the site's name and a search bar, followed by a central banner with the text "A Website Providing Information and Tools For The Competitive Business" and a collage of images. Below the banner is a large "Questions?" text and the MAST logo. On the right side, there is a "Site Updates" section listing various articles and reports with their dates and authors, such as "Crop Insurance Price History" and "Current Grain Outlook Newsletter".