



Energy Situation in Ag

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**See report to the Kansas Energy council entitled:
“Energy Use in the Kansas Agricultural Sector”
by Kastens, Dhuyvetter, Mintert, Nelson, and Li
www.agmanager.info**

**Risk & Profit Conference, Manhattan, Kansas
August 17-18, 2006**

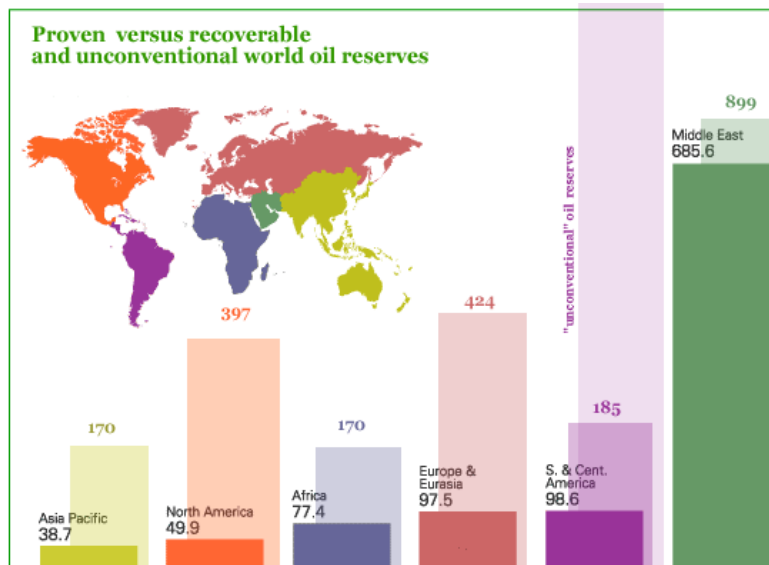
Running out of oil and U.S. energy independency

Scarce Energy?

- 1859: Drake discovers oil in Pennsylvania
- 1879: USGS formed to deal with running out of oil
- 1882: 95M bbl remain (Institute of Mining Engineers)
- 1918: 3 million cars on the road
- 1919: auto industry shouldn't ignore that only 20 years left (Scientific American)
- 1926: 4.5B bbl left in U.S. (Federal Oil Conservation Board)
- 1930: 18 million cars
- 1932: 10B bbl left in U.S. (Federal Oil Conservation Board)
- 1944: 20B bbl left in U.S. (Petroleum Administrator for War)
- 1950: 100B bbl left in world (American Pet. Institute)
- 1980: proven oil reserves 648B bbl
- 1993: proven oil reserves 999B bbl
- 2000: proven oil reserves 1016B bbl

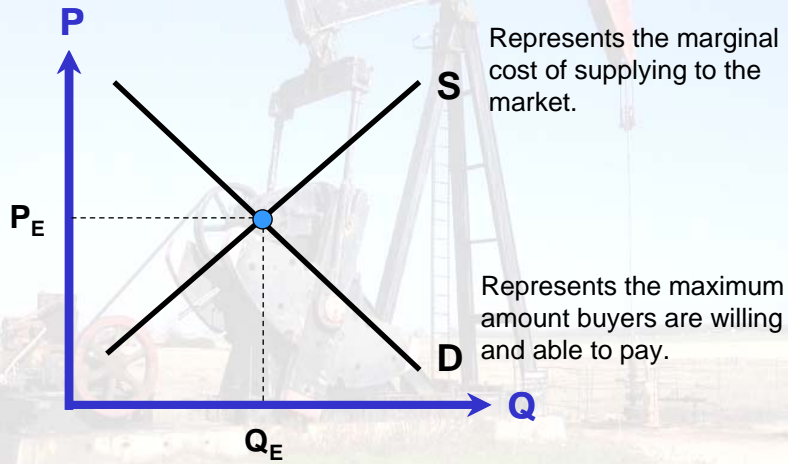
Scarcity is an economic issue, not a physical one

3

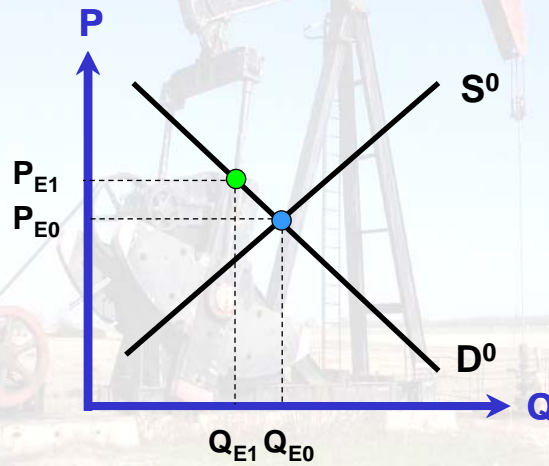


4

Supply and Demand determine prices ...

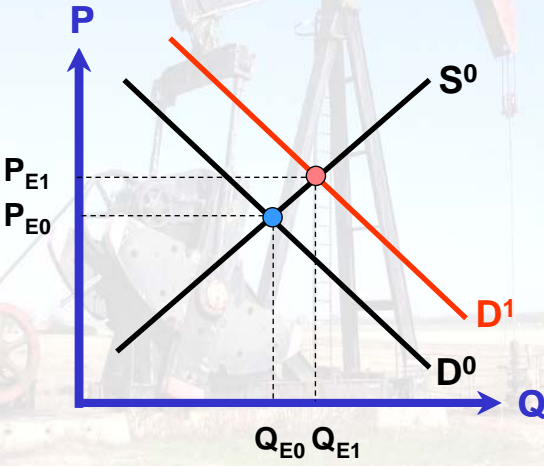


Supply control results in increasing prices and a reduction in quantity ...



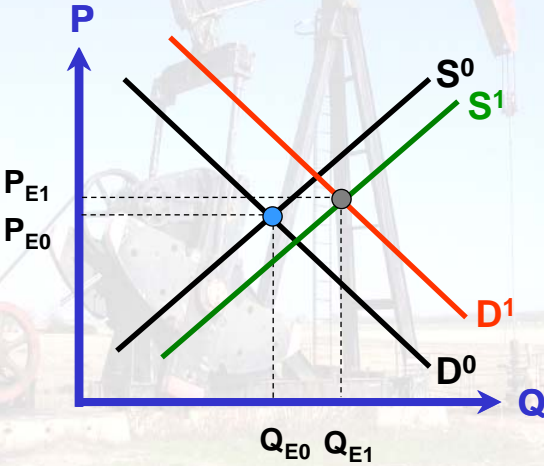
Think of OPEC in the 1970s

Increase in demand, all else constant, results in increasing prices and an increase in quantity ...

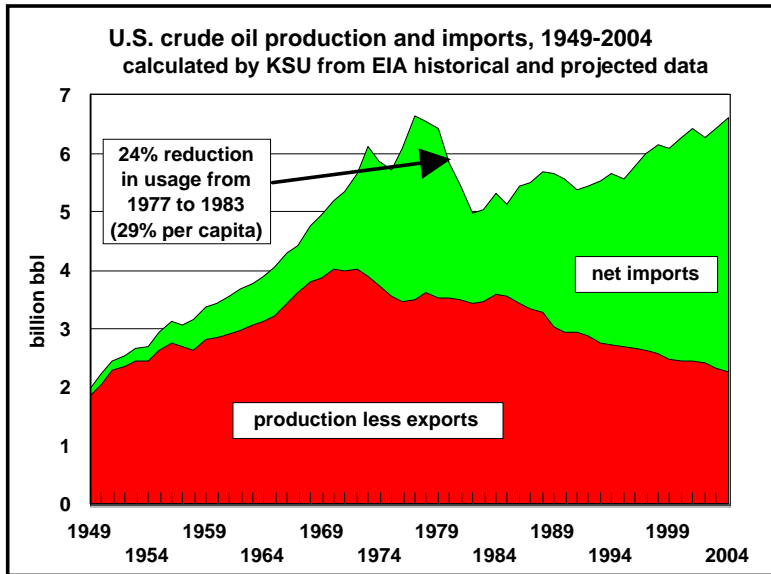


Think of China recently

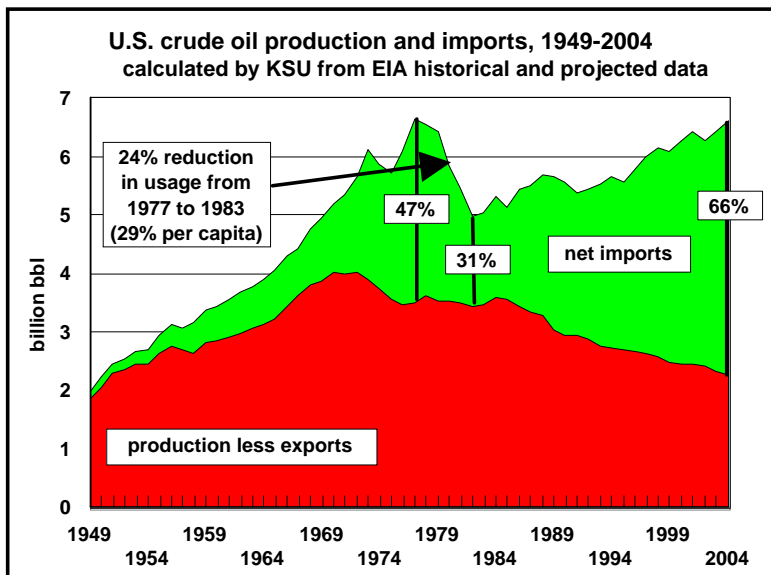
Increase in demand and increase in supply result in increasing quantity and ??? change in price ...



High prices induce technological change

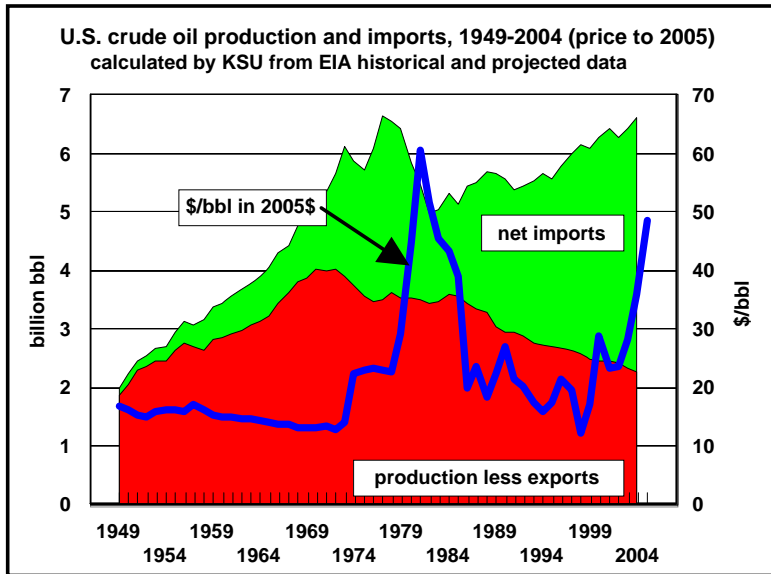


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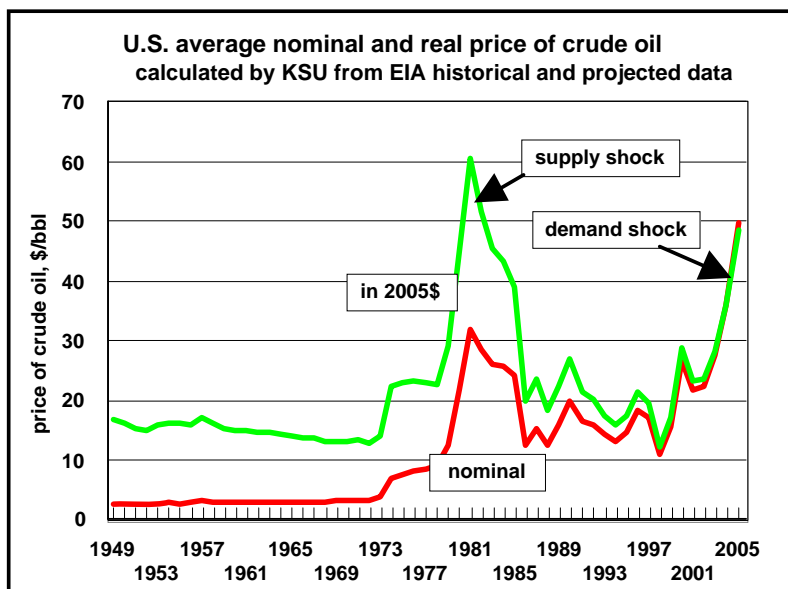


Is crude oil self-sufficiency a reasonable goal? Substitutes for crude? 5B gal ethanol might replace 0.066B bbl crude (1.51% of imports)

10

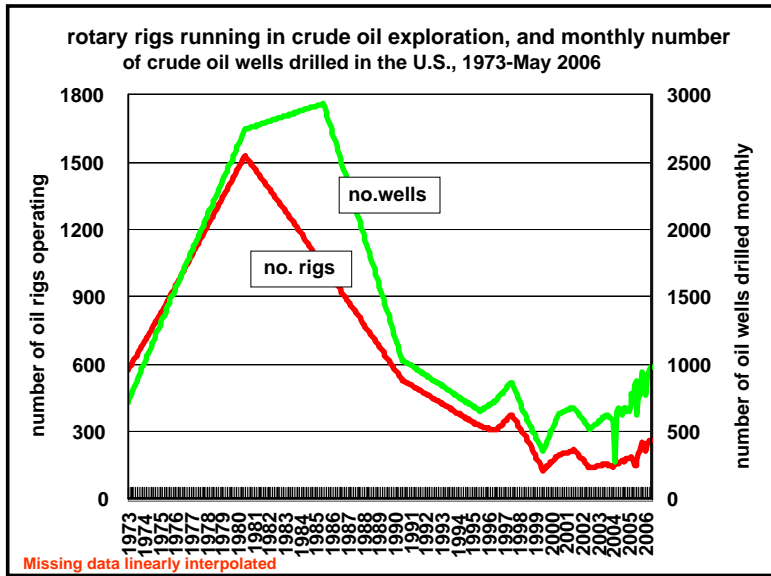


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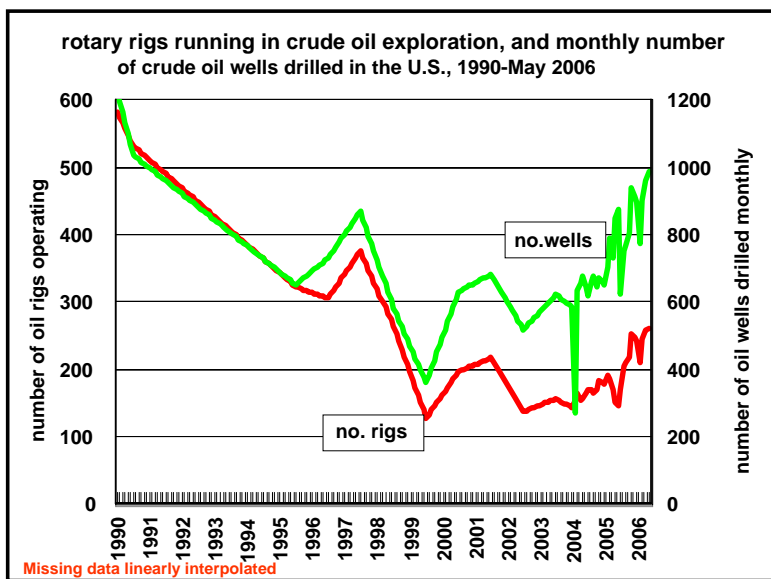


Markets will still work; but will prices fall as fast this time?

12

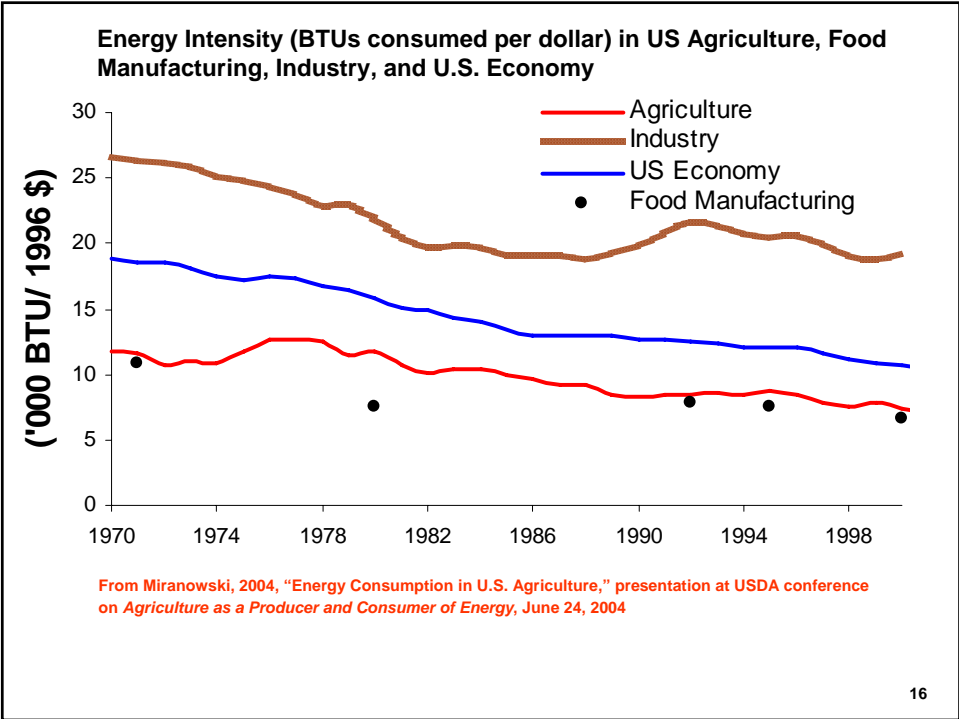


Price decimated the U.S. oil industry in the late 1980s and 1990s



Markets will work again and supply will increase as demand is tempered

Energy use in agriculture



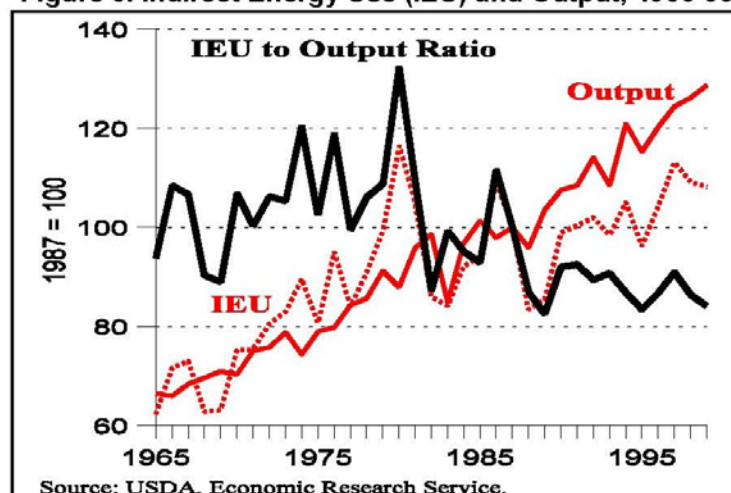
Congressional Research Service (CRS)
“Energy Use in Agriculture: Background and Issues”

- **Direct energy use**
 - Fuel and electricity to power farm activities
 - 1.1×10^{15} Btu (65% of total farm use)
- **Indirect energy use**
 - In fertilizers and chemicals produced off farm
 - 0.6×10^{15} Btu (35% of total farm use)
- **Ignores fuel embodied in machinery manufacturing and non-farm transportation**

17

Agriculture has become about 10% more efficient in terms of indirect energy usage from 1965 to 1999

Figure 6. Indirect Energy Use (IEU) and Output, 1965-99



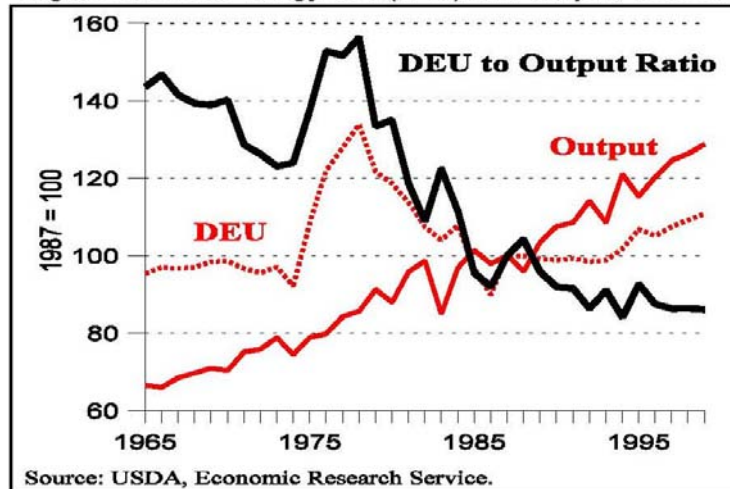
Source: USDA, Economic Research Service.

From CRS (Congressional Research Service) “Energy Use in Agriculture: Background and Issues,” November 19, 2004, by Randy Schnepf

18

Agriculture has become about 40% more efficient in terms of direct energy usage from 1965 to 1999

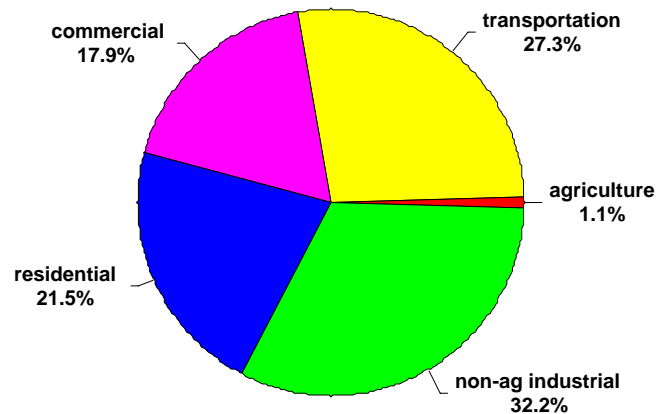
Figure 5. Direct Energy Use (DEU) and Output, 1965-99



From CRS (Congressional Research Service) "Energy Use in Agriculture: Background and Issues," November 19, 2004, by Randy Schnepf

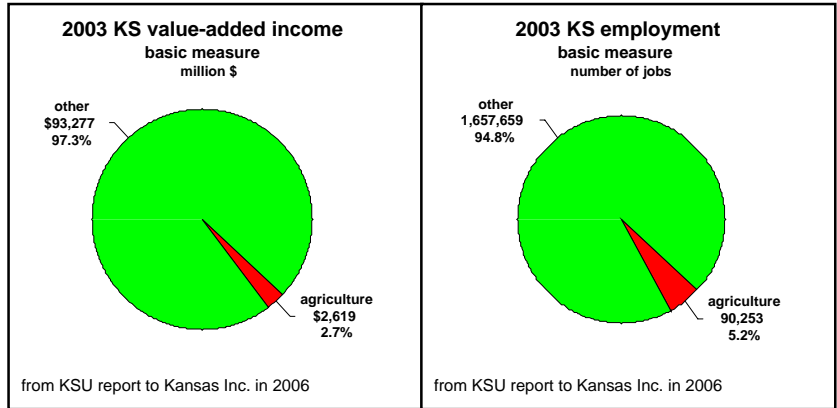
U.S. Direct Energy Consumption, 2002

aprox. 98,000 trillion Btu total

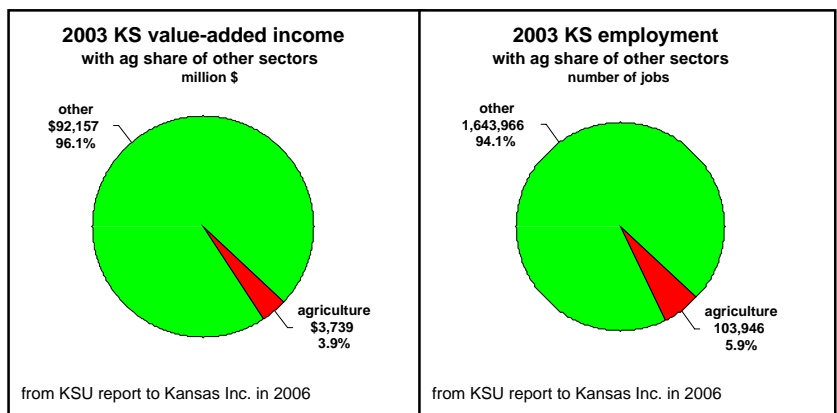


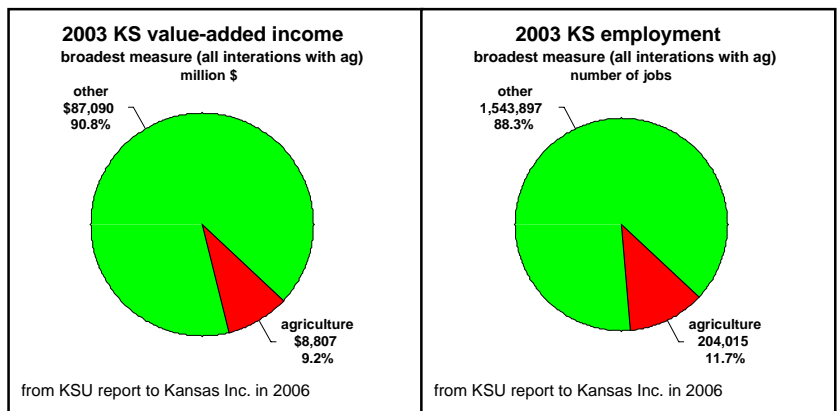
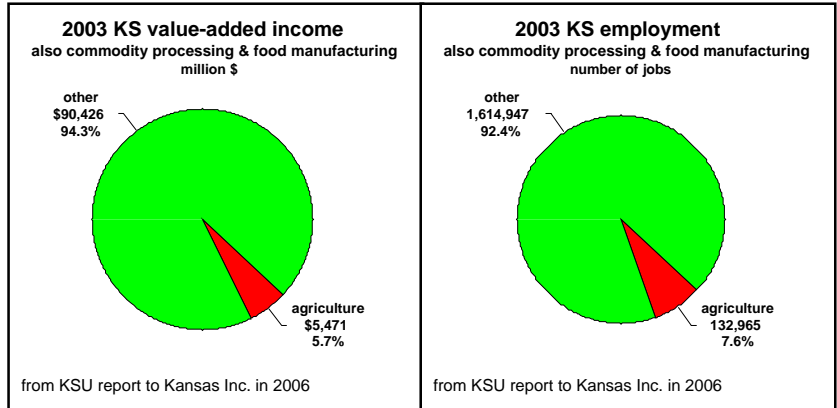
as reported in CRS study

Reducing ag's use of energy won't greatly fix the U.S. energy "problem"



Narrow interpretation of ag industry's importance to Kansas economy



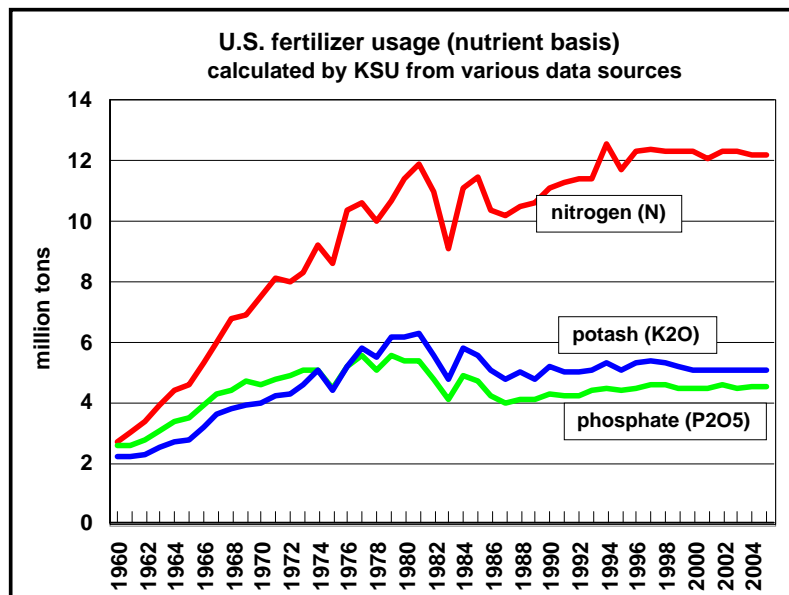


Broadest measure, includes for example, all meat packing industry

Policy motives . . . things to think about

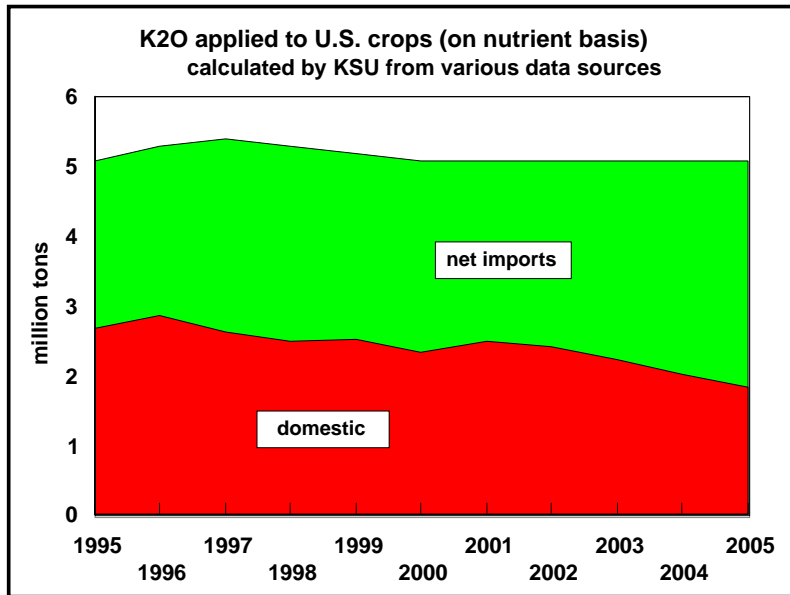
- World is not running out of oil, but it may be “expensive” for awhile
- U.S. energy independency would be very expensive to acquire
 - Ethanol may be good for farmers but it won’t greatly reduce dependency on energy imports
 - Protectionist tendencies could be costly
- Saving energy in agriculture won’t have a large impact on the U.S. energy “problem”
- But, at the micro scale, energy matters to ag
 - Farm fuel and fertilizer cost

25



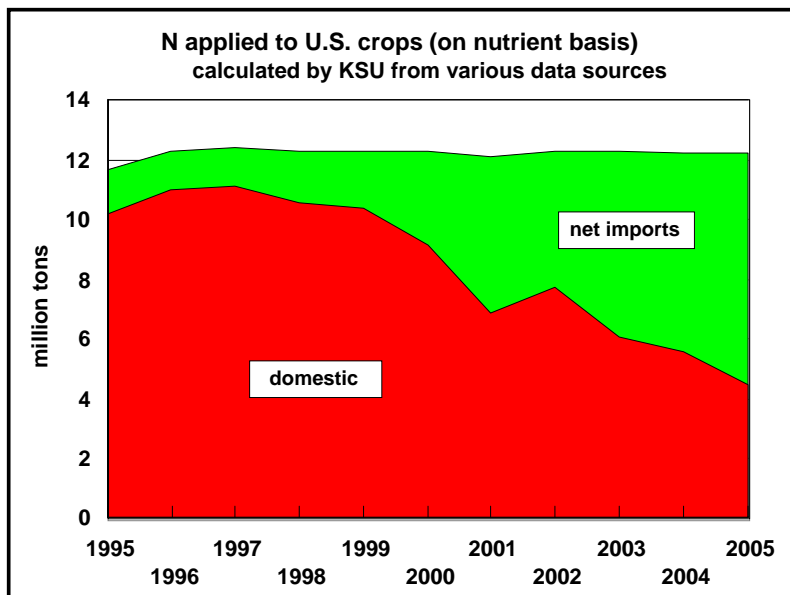
Ag depends on fertilizer and it is highly related to energy prices

26



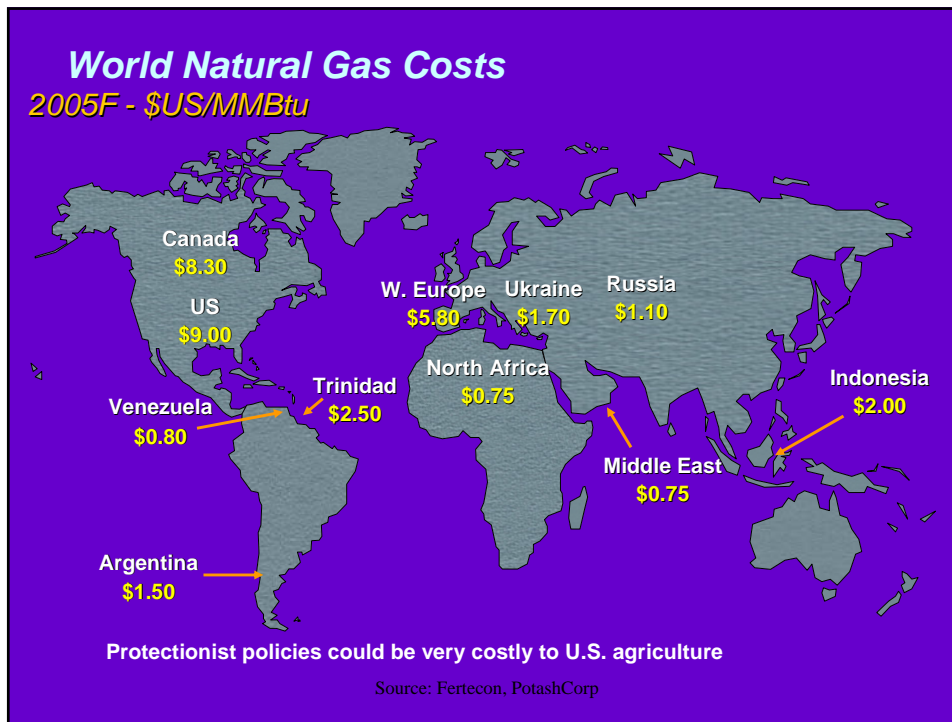
Potash imports are growing in importance

27



Protectionist policies could be very costly to U.S. agriculture in the short run

28



Policy motives . . . things to think about

- Carrots preferred to sticks
- Ag producer subsidies:
 - work best where they reinforce or catalyze existing economic trends
 - are best accepted by producers if they enhance future profits
 - get greatest return for taxpayer if they are technology investment oriented, where the technology stays when the subsidy leaves
 - success depends on education & research
 - ag is small but often important politically
- Enough subsidies on ethanol already!
- Farmers generally maximize profits

Renewable Energy

32

4 Major Renewable Energy Opportunities for Kansas Agriculture

- **Ethanol from Commodity Crops**
 - corn
 - sorghum
- **Biodiesel**
 - soybeans
 - animal fats
 - other feedstocks (perennial oils)
- **Bioethanol**
 - herbaceous energy crops (switchgrass)
 - corn stover
- **Anaerobic Digestion of Livestock Manures**
 - dairy operations only

from: Richard Nelson, Biological and Agricultural Engineering, KSU

33

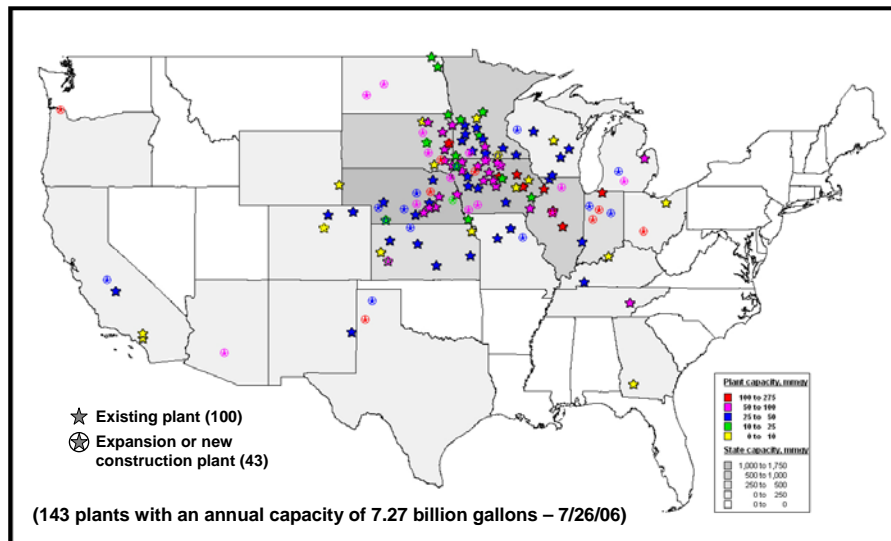
Ethanol from Commodity Crops

- Known commodity and state and national policies (e.g., subsidies) will influence future size of the industry
- Renewable Fuels Standard (minimum 7.5 billion gallons of renewable fuels) will play a role nationally on future Kansas development as well as the cellulosic ethanol requirement of 250 MGY by 2013
- Drivers of ethanol industry:
 - Subsidies
 - Banning of MTBE in some states
 - Mandatory ethanol inclusion in some states
 - High energy prices

34

Existing and new ethanol plants

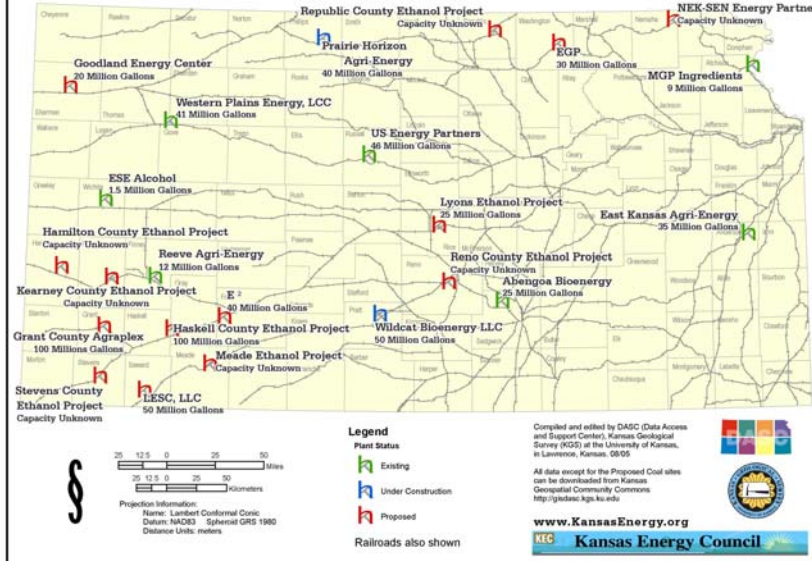
Source: Renewable Fuels Association (RFA), Kansas State University



35

PROPOSED and EXISTING ETHANOL PLANTS in KANSAS

October 2005

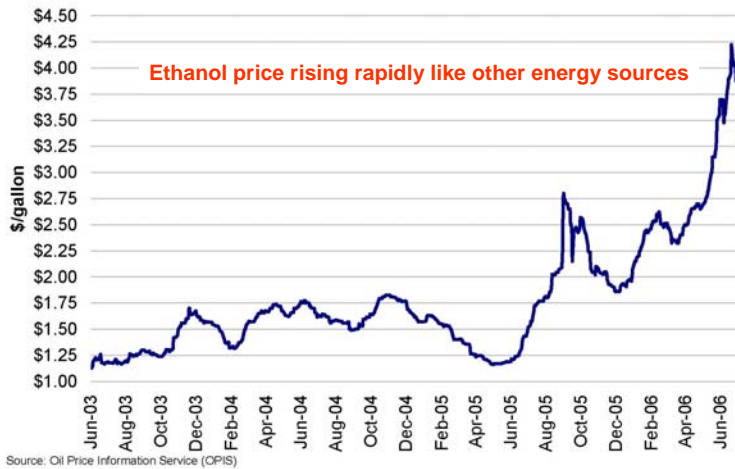


October, 2005

7

Chicago Board of Trade

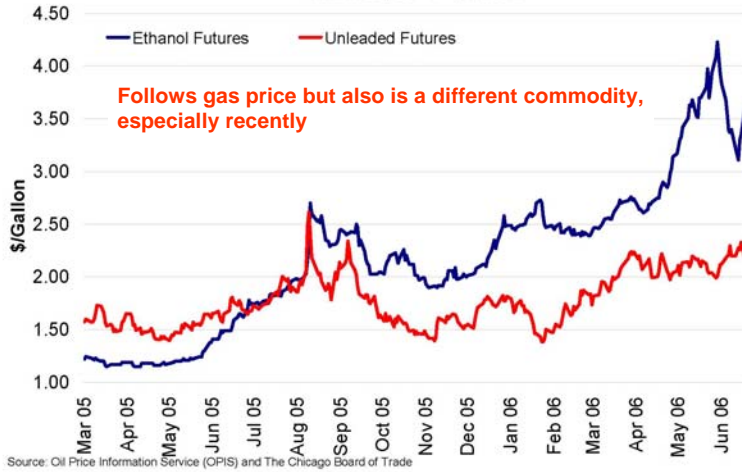
Daily Chicago Cash Ethanol April 2003 to Present



www.cbot.com

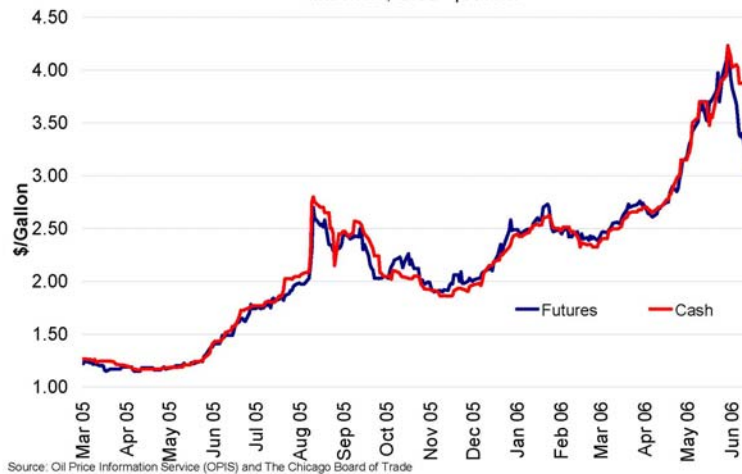
Weekly Chartbook for CBOT Ethanol Futures Contract, www.cbot.com/ethanol

CBOT Ethanol Futures versus NYMEX Unleaded Futures March 23, 2005 - present



Source: Oil Price Information Service (OPIS) and The Chicago Board of Trade

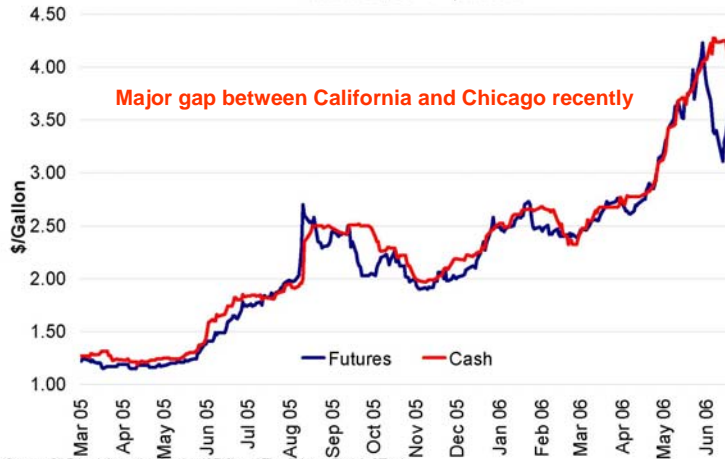
CBOT Ethanol Futures versus Chicago Cash Ethanol March 23, 2005 - present



Source: Oil Price Information Service (OPIS) and The Chicago Board of Trade

CBOT Ethanol Futures versus Los Angeles Cash Ethanol

March 23, 2005 - present



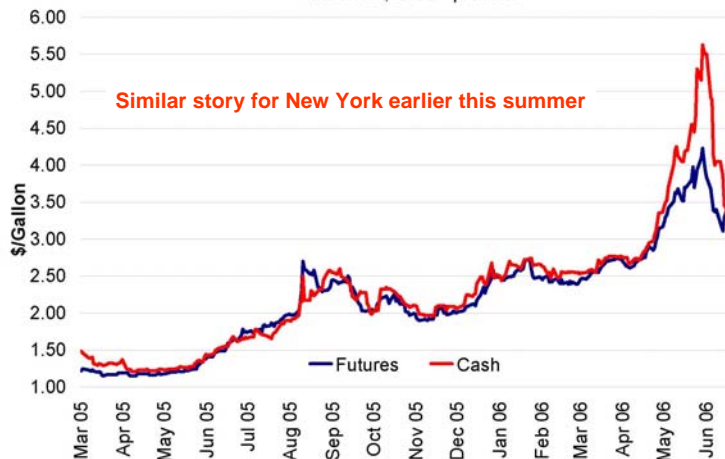
Source: Oil Price Information Service (OPIS) and The Chicago Board of Trade

www.cbot.com

Weekly Chartbook for CBOT Ethanol Futures Contract, www.cbot.com/ethanol

CBOT Ethanol Futures versus New York Cash Ethanol

March 23, 2005 - present

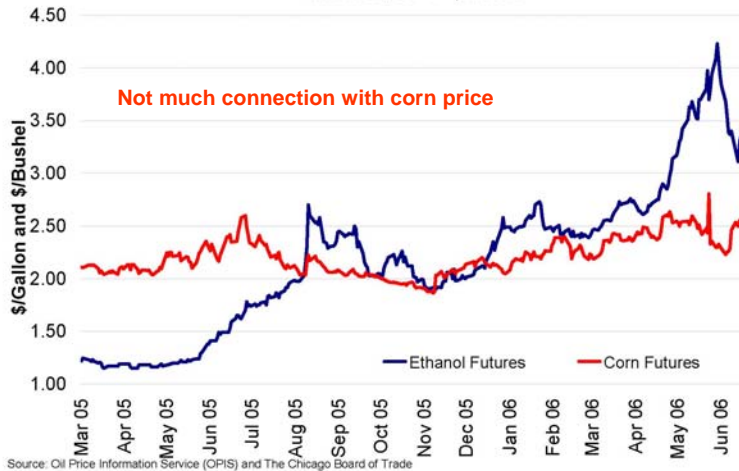


Source: Oil Price Information Service (OPIS) and The Chicago Board of Trade

www.cbot.com

Weekly Chartbook for CBOT Ethanol Futures Contract, www.cbot.com/ethanol

CBOT Ethanol Futures versus CBOT Corn Futures
March 23, 2005 - present



Source: Oil Price Information Service (OPIS) and The Chicago Board of Trade

www.cbot.com

Weekly Chartbook for CBOT Ethanol Futures Contract, www.cbot.com/ethanol

Ethanol consideration for grain producers

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Futures & Options > My Futures & Options Monday, July 31, 2006 7:51:37 AM CDT

My Futures & Options Information

Contract Open High Low Last Change Bid Ask Vol Op Int Time

Contract	Open	High	Low	Last	Change	Bid	Ask	Vol	Op Int	Time
SEP 06	0	2392	2364	2372*	-4			26498	403640	13:43
DEC 06	0	2560	2530	2534*	-6			46402	546433	13:43
MAR 07	0	2696	2670	2672*	-10			4029	118973	13:43
MAY 07	0	2790	2766	2770*	-6			570	24978	13:43
JUL 07	0	2880	2850	2856*	-6				961	13:43
SEP 07	0	2934	2910	2930*	-10				750	13:43
DEC 07	0	3024	3000	3004*	-14				518	13:43
MAR 08	0	3120	3114	3114*	-10				853	13:43
MAY 08	0	3194	3174	3174*	-24			5	2947	13:43
JUL 08	0	3260	3240	3242*	-16			1145	8856	13:43
SEP 08	0	0	0	3204*	-14			0	544	13:44
DEC 08	0	0	0	3236*	-20			1315	55004	13:43
DEC 09	0	3390	3376	3380*	-16			187	463	13:43

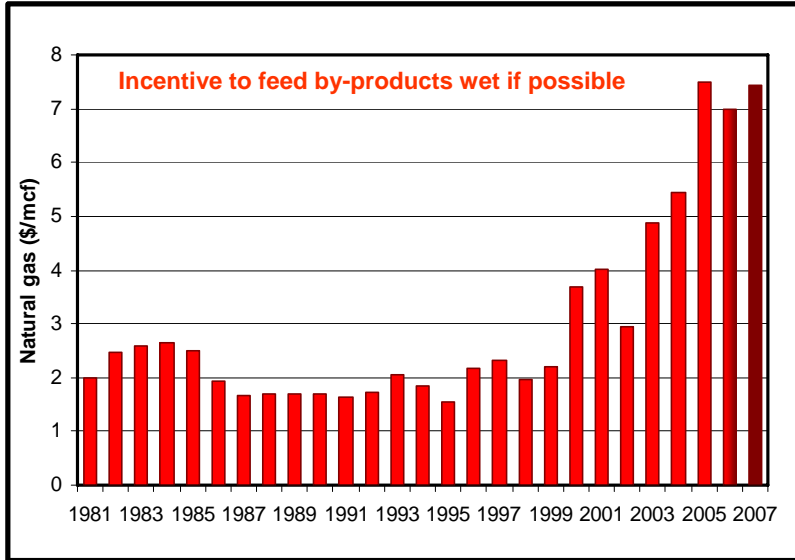
Click on the chart icon to view the graphical chart print version

Ethanol demand premium?

Click on the chart icon to view the graphical chart

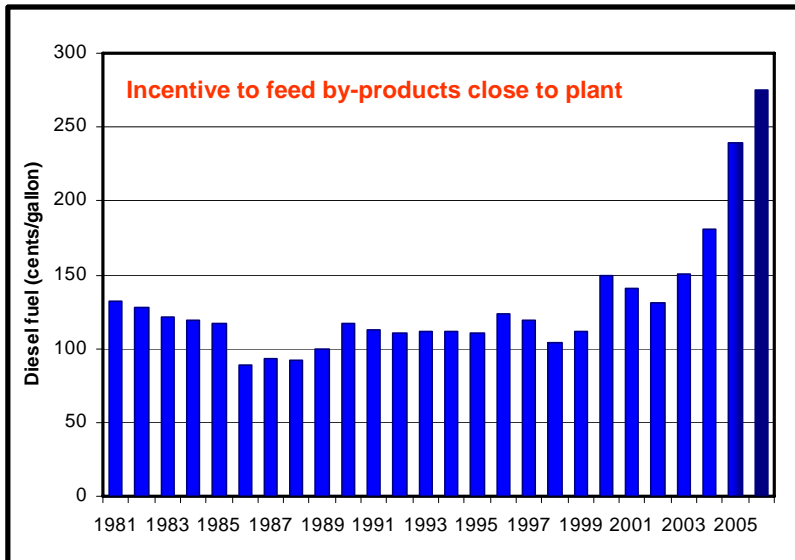
Portfolio Manager Graphical Charts Java Charts

Natural gas prices...



51

Diesel fuel prices...

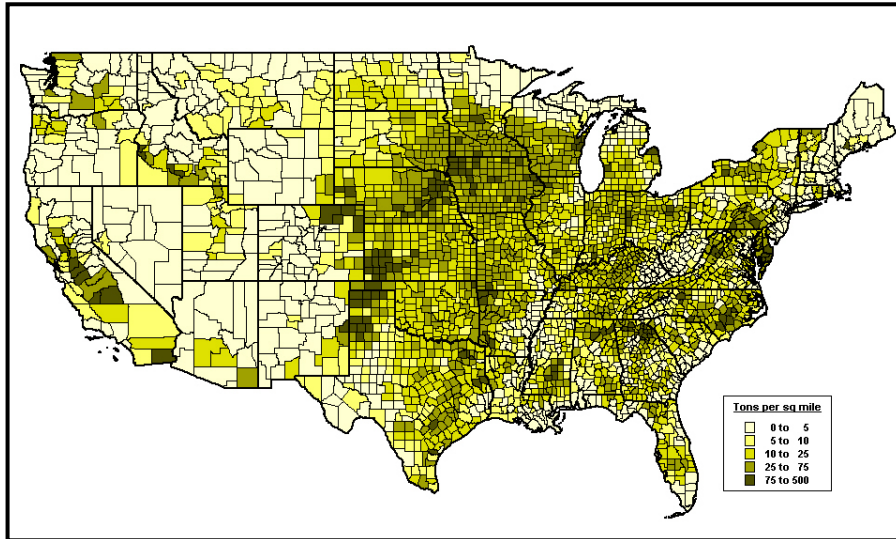


Where will (should) future plants locate?

53

Potential DDGS consumption (51.56 million tons)

Source: Kansas State University estimate



Where will (should) future plants locate?

54

Should I use ethanol in my vehicles?

	BTU	gas equiv	mileage study
Gasoline	125,071	1.00	American
Diesel	138,690	1.11	Coalition
Ethanol	76,000	0.61	<u>Ethanol</u>
E85	83,361	0.67	0.985
E10	120,164	0.96	0.978
E20	115,256	0.92	0.949
E30	110,350	0.88	

Until we get better information may want to split the difference and buy:
 E10 if 2% lower price at pump
 E85 if 17% lower price at pump

55

Biodiesel

- **Main Kansas biodiesel feedstocks are:**
 - soybeans and animal fats/waste greases
 - use as feedstocks depends upon competing market factors and biodiesel demand
- **Industry growing due to national 'Blenders Tax Credit' and Kansas could potentially increase production and use due to the EPA Ultra Low Sulfur Diesel (ULSD) rules for 2007 – 2014**
 - low-blend (2%) biodiesel as a lubricity component
 - demand of 8+ mil gal for KS on-highway (760 U.S.)
- **Small-scale (e.g., on-farm) biodiesel production is not feasible; community-scale possible depending upon:**
 - 1) Market demand
 - 2) Sale of by-products

from: Richard Nelson, Biological and Agricultural Engineering, KSU

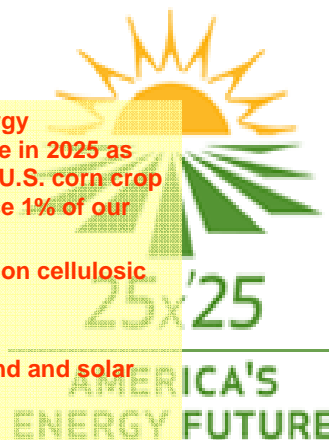
56

National Cellulosic Biomass Focus

Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply

April 2005

- Assuming that U.S. energy consumption is the same in 2025 as today, using 40% of the U.S. corn crop for ethanol would replace 1% of our energy needs.
- Likely will depend more on cellulosic ethanol
- . . . or, perhaps more wind and solar



57

Potential Biomass Feedstocks for Meeting the “Billion Ton” and “25x25” National Goals

■ Corn Stover

- Potential exists in Kansas for use of corn stover, but serious questions arise concerning the sustainability of the land base with respect to consistent removal and cost
- Resource assessment (supply curves) being developed for edge-of-field costs of \$5 to \$35 per dry ton

■ Herbaceous Energy Crops (switchgrass)

- Potential exists in Kansas for use of herbaceous energy crop production, but competing land uses as well as established, viable end-use markets are present impediments to development
- Resource assessment (supply curves) being developed for edge-of-field costs of \$5 to \$35 per dry ton

from: Richard Nelson, Biological and Agricultural Engineering, KSU

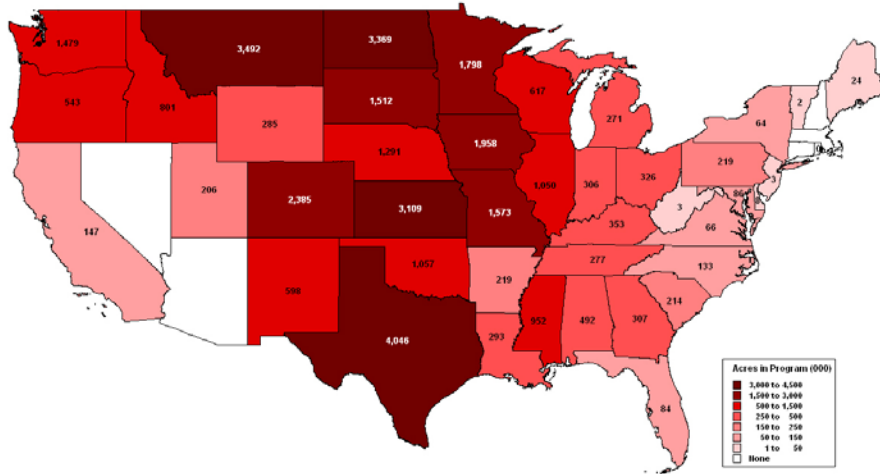
58

Bio-ethanol (cellulosic)

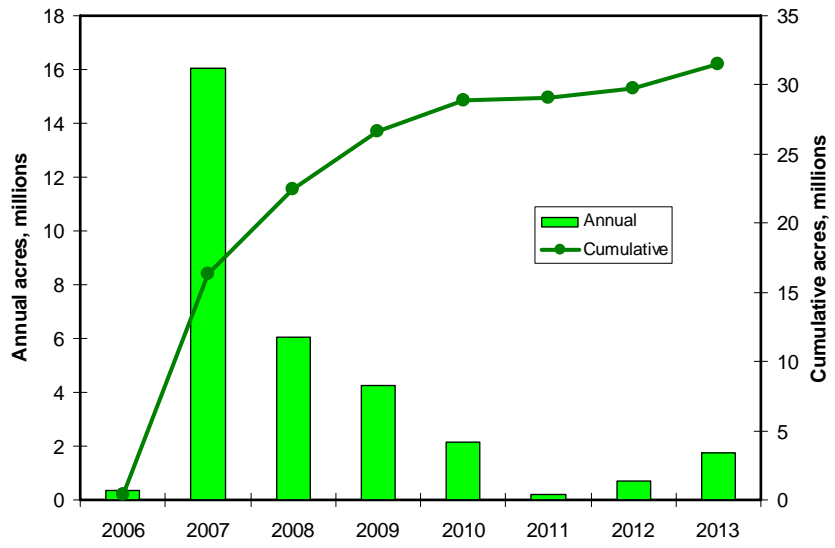
- **Grains: 100 gal/T of input (around 90%dm)**
 - 150 bu/a corn crop = 420 gal/acre
 - At \$2.50/bu corn will be \$0.89/gal for feedstuff
- **Biomass 50-70 gal/T of input (potential >100)**
 - Convert from grain to forage production?
 - 20 T/acre corn silage (7.8 T 90dm) = 390-546 gal/a
 - Sell crop residue
 - Wheat straw sells for \$45/T, which implies a feedstuffs cost of \$0.64-\$0.90/gal
- **Would have a hard enough time competing even if manufacturing costs were the same as with grain-based ethanol plants**
 - Or will grassland or CRP switch to switchgrass?

59

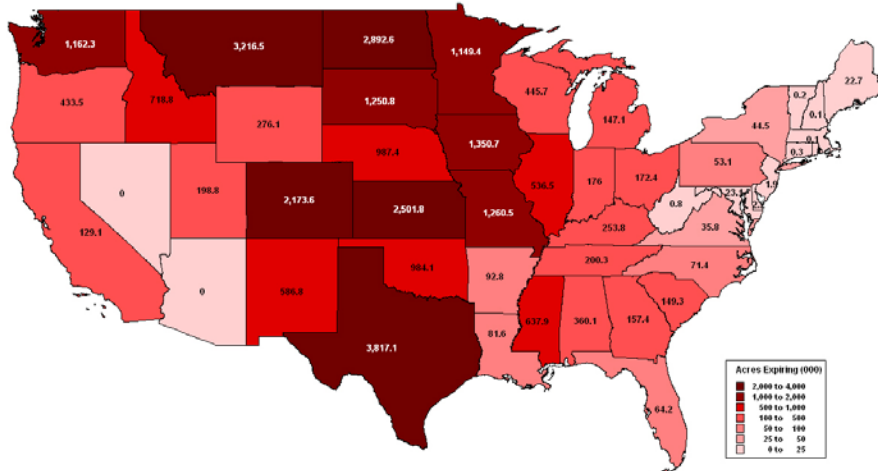
**Current acres in CRP, 2006
(total = 36,015)**



Schedule of CRP Contract Expirations



**Acres in CRP scheduled to expire in 2006-2010
(total = 28,822)**



**Blurb from DTN pertaining to CRP being used for production
(6/28/06)**

U.S. hunting and fishing groups as well as other wildlife and conservation organizations have reacted with some concern about the possibility that the federal government may permit the harvesting of biomass from land enrolled in initiatives such as the Conservation Reserve Program. With all the talk of moving to alternative fuels -- especially cellulosic ethanol -- some in Washington have pointed out that CRP acreage could be a fine place to harvest plant material for conversion to fuel.

A coalition of more than 20 outdoor groups recently took a step to assure they would have a seat at the table when Congress sits down to write the conservation title of the next farm bill. In a letter to key House and Senate members, the groups recommend that legislators make certain to assess the effects on wildlife and soil and water quality of harvesting biomass before deciding it would be good to remove stubble and vegetative cover from CRP acres. The groups also volunteered to provide Congress with their collective wildlife, habitat, and conservation expertise and research data as the conservation title is being drafted.

There currently are about 36 million acres enrolled in the CRP.

Anaerobic Digestion of Dairy Manure

- Energy production (Btu and kilowatt-hours) determined for Kansas dairy operations and herd sizes of 100 – 10,000+ head

- Cost analysis (\$/kW-h production cost) based on Western Governors' Association data

<http://www.westgov.org/wga/initiatives/cdeac/Biomass-supply.pdf>

On-site production cost ranges from \$0.0731 to \$0.243 per kW-h for herd sizes greater than 250

from: Richard Nelson, Biological and Agricultural Engineering, KSU

64

Will We Make the 25x25 goal?

- Ethanol might make 3.75%
 - If corn yields increase 1.5%/yr
 - U.S. energy consumption is flat
 - 40% of corn grain crop to ethanol
 - Biomass ethanol double grain-based ethanol
- 6% renewable energy in 2005
 - 3.5% is non-hydroelectric (NH)
- NH would need to increase 6 fold!
- Oil and natural gas won't sit idly by
 - 25x25 goal will be abandoned along the way

65

Summary

- Renewable energy will make small inroads into the overall energy picture
 - Grain farmers will benefit; livestock farmers??
- Petroleum energy will continue to dominate in our lifetimes
- Energy prices will fall again as supply and demand equilibrate
 - Tough on farmers in the near future

66

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Site Updates

- [Dynamics of Change: Must I Grow My Farm?](#)
July 25, 2006 by Kastens and Dhuyvetter
- [Crop Basis Maps](#)
July 20, 2006, by Kevin Dhuyvetter
- [Updated Crop Basis Tool](#)
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Updated July 6, 2006 by Kevin Dhuyvetter
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June 27, 2006 by Funk and Langemeier
- [Economic Analysis of Accuracy of N Application](#)
April 14, 2006 by Kastens, Dhuyvetter, and Dumler
- [KSU-Crop Budgets 2006.xls](#)
December 13, 2005 by Dhuyvetter et al.

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