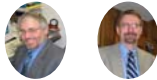


Future of Agriculture Economies of Size and Trends in Agriculture

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Funded by the USDA's Risk Management Agency (RMA)



Not a “futurism” discussion . . .

- **Futurism**
 - About cool things way in the future
 - Fun to talk about
 - Daydreaming, the mind wanders and wonders
 - Can hear about it and forget it
- **Nearby future**
 - Our lifetimes (and what happens at our death)
 - Often painful realities upon us
 - May have to make decisions today
 - Probably won't go away
 - Consider that which is statistically probable
 - That which is driven by economic forces

2

What motivates farmers?

- **Farming: profit or lifestyle?**
- **About what will make *some* farms profitable in the future**
 - The ones that will be around in commercial ag
- **One part of a bigger picture**
 - What to do with wealth
 - What to do with human capital (personal skills)

3

Economies of size: the driving force

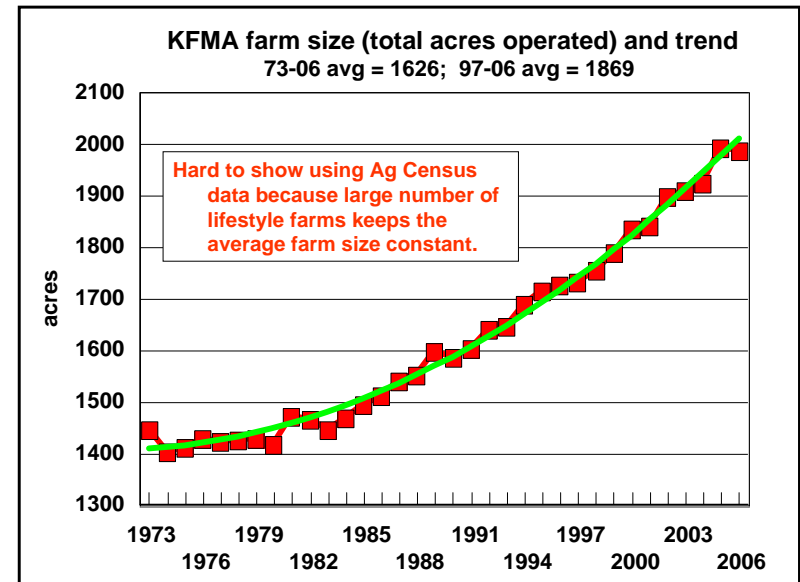
- **Per-unit costs fall as a firm gets bigger**
 - Essentially about spreading fixed costs
 - May mean higher prices instead

5

Is EOS for real?

- Is there a benefit to targeting growth and size?
- Or, is growth an accident of good management (plowing profits back into the farm or business)?
 - Walmart: size, or a good retailing idea??
 - Why don't we observe numerous small packing plants?
 - Why don't we observe many small farms with a common manager?

6



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

7

Is EOS for real?

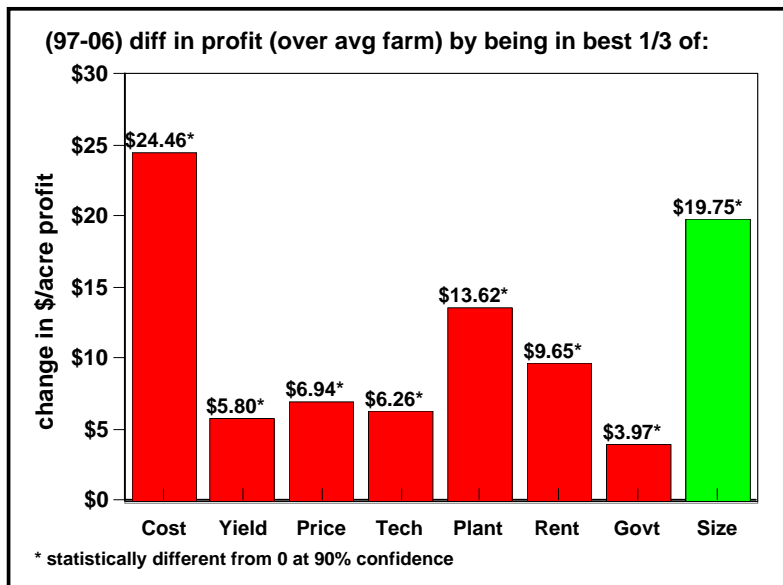
- EOS doesn't mean you have to be big to be low cost
 - Many small farms have low costs
 - But, it's harder to be low cost if you are small
 - EOS is an "on average" phenomenon
- Little evidence of big, high cost, farms
 - They've gone broke



Is EOS for real?

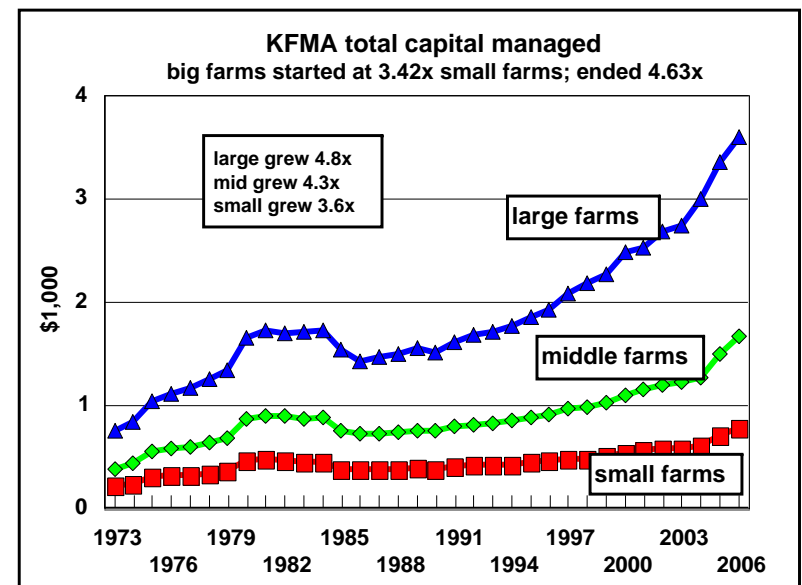
- Hard to distinguish effect of good management and other factors from the effect of size
- Statistical regression is one way to do it
 - After you correct or adjust for the impact of other factors, is there still a positive impact on profit associated with size?

10



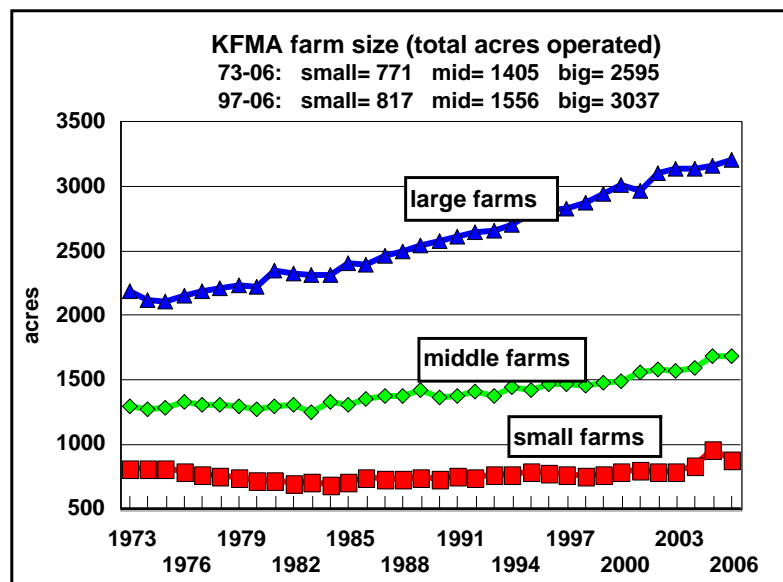
A size effect remains – evidence that EOS is for real

11

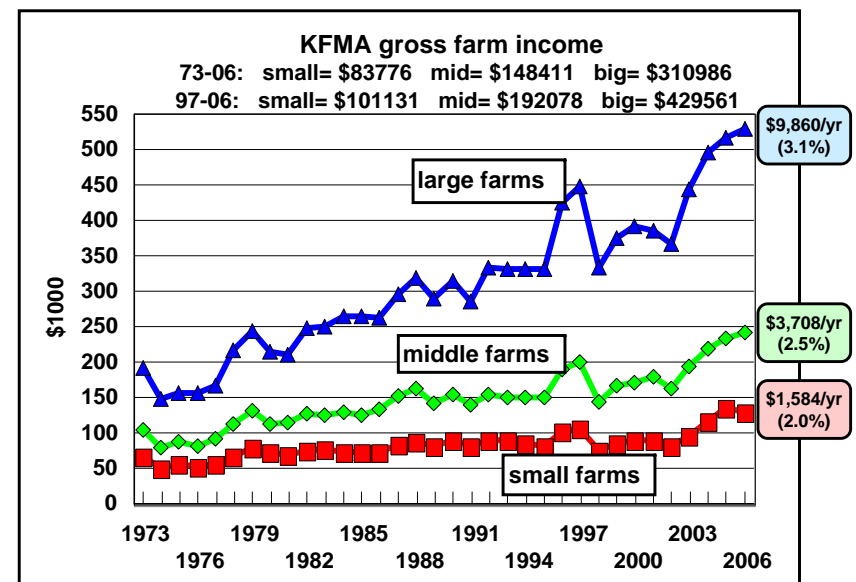


A portion of growth in \$ values is inflation

13

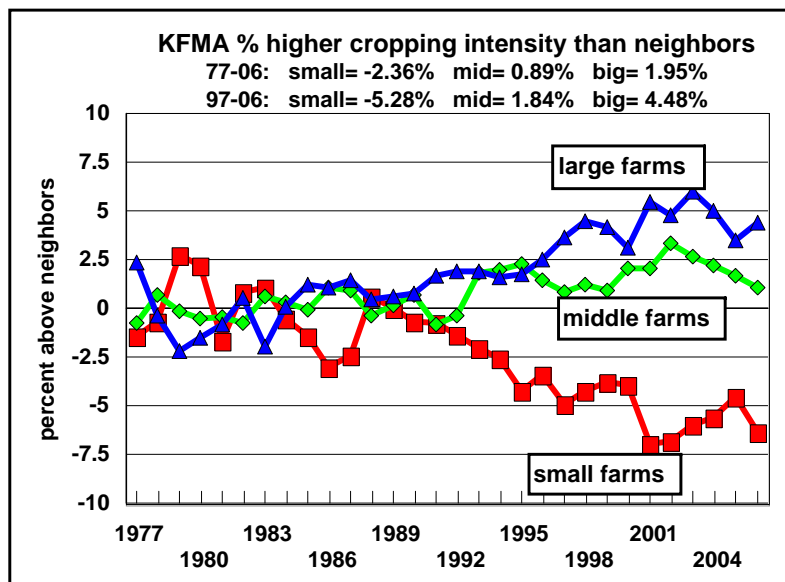


14



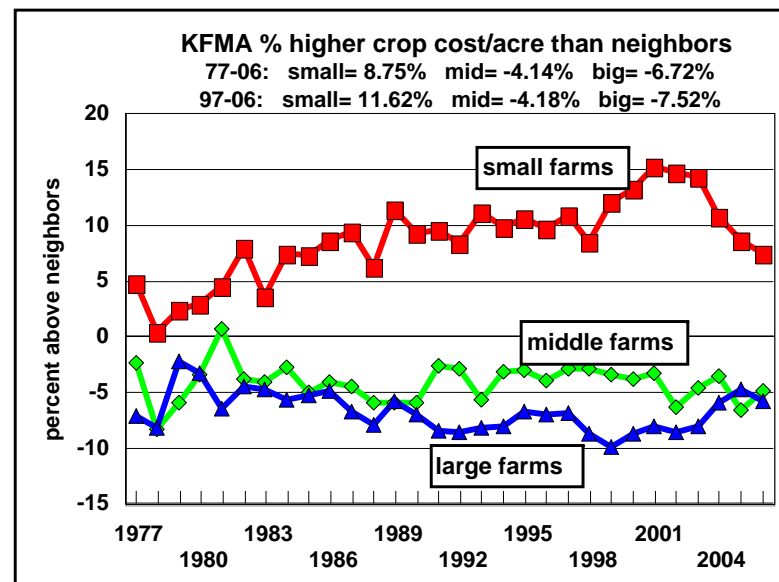
Even the "big" farms aren't all that big!

15

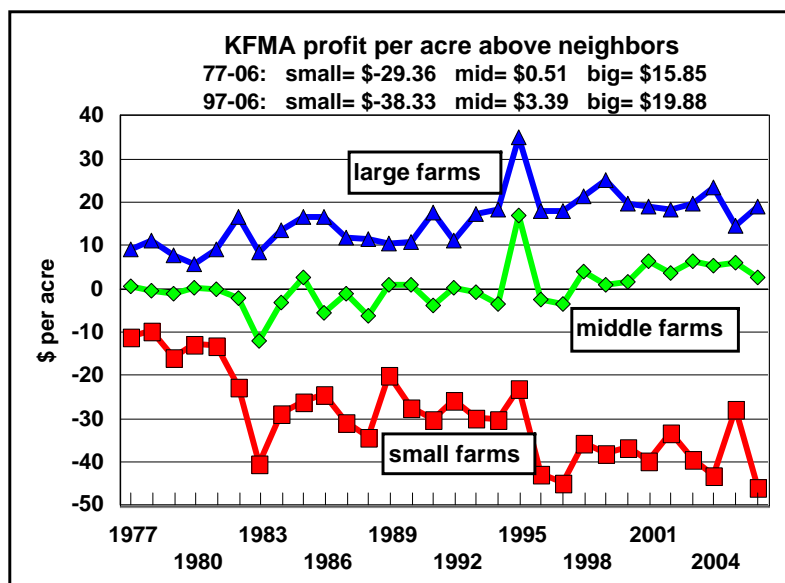


Big and small really departing from each other in last 15 years

18



19



The characteristic differences across farm sizes result in profit differences

20

Why are large farms more profitable?

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

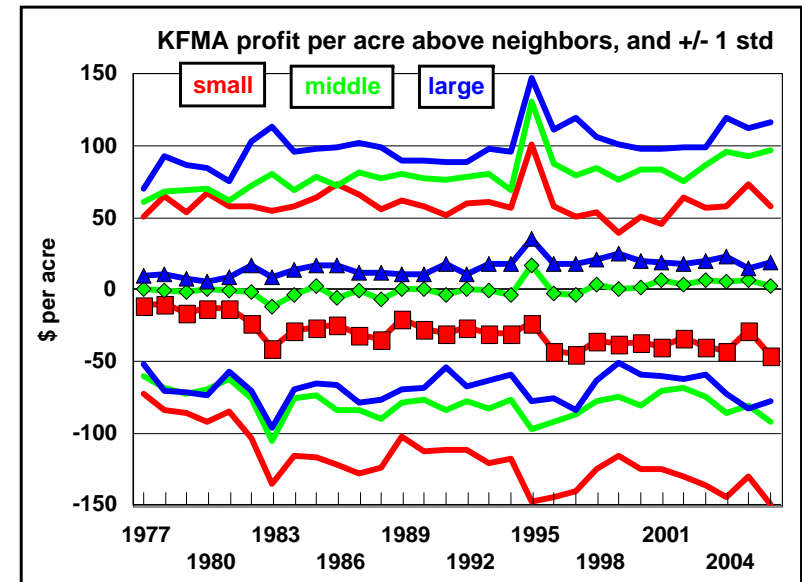
21

Large farms are not only more profitable

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

22

More important to be good than to be big ...



... so don't use inadequate size as an excuse to be unprofitable

23

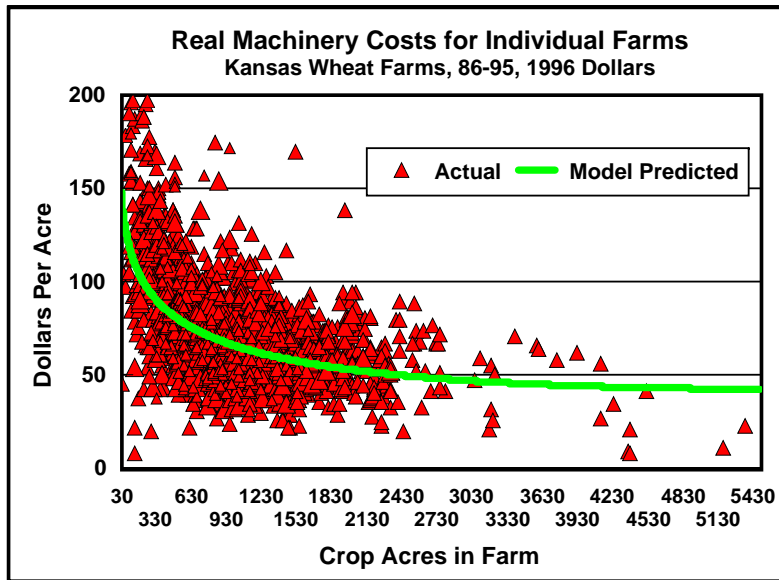
No right to profit from size

- Being large does not ensure profitability
 - Inherited, but poorly managed (inattentive to size and growth issues), farms are an example. Though it might take years, such farms eventually disappear.
- A poor-managing heir would be better off:
 - Investing his/her wealth elsewhere
 - Renting the land portion to a good manager

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Do EOS turn to diseconomies at sufficiently large size?

26



You be the judge! But where are the 10,000 acre farms and what might their machinery costs be?

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Do EOS turn to diseconomies at sufficiently large size?

- Government payment limitations?
 - Business structure
 - Willingness to share ownership and management
- Large farms often are targeted for...
 - environmental concerns (EPA)
 - crop insurance audits
 - terrorism?
- Can management handle size and growth?

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What about niche farming? Do we really need to get on the EOS bandwagon?

- Targeting a niche is a risky game plan
- Perceived niches not immune to EOS
 - “Remember, every niche is a commodity in the making.” Vincent Amanor-Boadu
- Becoming a large commercial farm also is a risky plan
- Recognize your comparative advantage

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Capturing EOS without growth

- Formal and informal business arrangements to capture EOS
 - Machinery partnerships among farms
 - MachineryLink and other rental services
 - Custom farming services
 - Input buying groups
- Here to stay....?
 - Transaction & timeliness costs may be too high
 - Possibly transitional only – ultimately one partner likely will emerge as dominant (but important transition)
 - Custom operators will give preference to size
- Successful farms will become
 - Astute assessors of costs for asset ownership and use
 - Astute price negotiators (to retain the related EOS)

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Changing EOS features across farm size

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

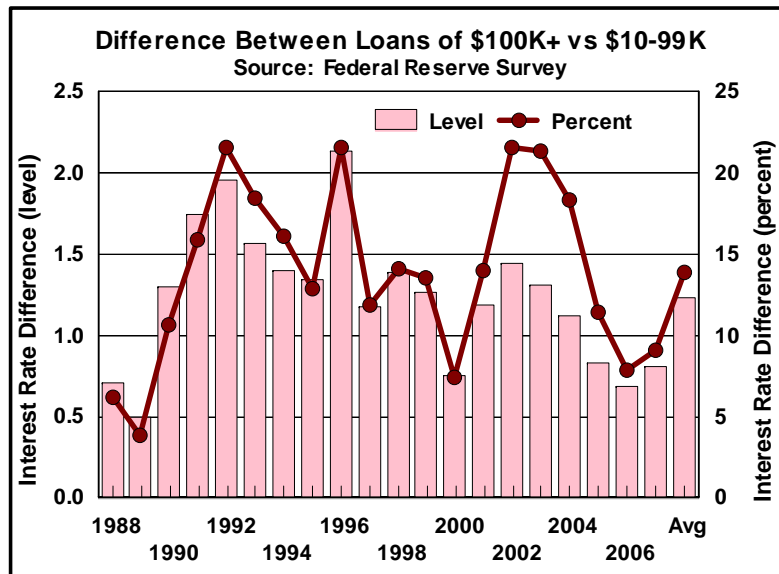


33

Changing EOS features across farm size

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

35



Bigger loans have lower interest rates

37

Changing EOS features across farm size

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

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EOS implications: labor

- **Technologies have been labor reducing**
 - Farms have not acquired human resource skills
 - Farms prefer labor saving technologies
 - No-till grows because it saves labor
 - But, labor EOS play out
- **Recent technologies are not labor-saving**
 - Precision ag
 - Guidance/assisted steering is labor saving
 - Intensive input management is not labor saving
 - ... but is, at some scale, following large fixed cost investment
- **Successful farms will**
 - Think of labor as an investment in human capital
 - Value employee skills besides management

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EOS implications: labor

- **Show young people they can start in farming as an employee, just like what happens in every other business**
 - Will happen as wages climb
- **Show established owner-operators how they can transform to employee/partner types without losing face, and without sacrificing wealth and happiness**

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EOS implications: equity

- **It takes so much to get started today!**
- **Internal profits (reinvest profits)**
- **Vertical accumulation**
 - Family wealth across generations
 - Diverging goals of heirs and forebears
- **Horizontal accumulation**
 - Family or non-family contemporaneous equity
 - Minority shareholders have poor protection
- **Successful farms will overcome the equity hurdles**

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EOS implications: debt

- **Capital is equity OR debt**
- **Debt often is the least-cost capital source**
- **If equity growth is internal:**
 - Farms using debt have an advantage for EOS
- **Recommendations to “pay down debt” are a vestige of traditional life-cycle thinking**
- **Successful farms will consider**
 - Divorcing the business from the individual
 - Targeting a debt-to-assets ratio rather than a debt level (think of agri-businesses)

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Trends . . .

1. Increasing consolidation
 2. Rapid technological change
 3. Greater connections to the non-ag world
 4. Increased computer work and paper work
 5. More reliance on people with specialized skills
- Trends go hand in hand with economies of size
 - #5 and #4 first since often get shortchanged

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5. Need folks with specialized skills

- Financial management
 - Agricultural economics and accounting
- Production management
 - Agronomy and animal science
- Machinery understanding and management
 - Agricultural engineering
- Spatial data management
 - Geography
- Computer specialists
- Legal counsel
- Production ag is becoming a people world

48

Folks with specialized skills

- Recognize the need
- Do specialized consultants exist
 - Are they worth their pay?
- In house?
 - Should I get trained?
 - Should an employee get trained?
 - Formal degree program, workshop, or what?
 - Should I hire ready-made folks?

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4. More paperwork -- actually more computer work

50

A. Improved accrual accounting

- Called by different names but allows a farm business to know at any moment in time it's net worth
- Much more than cash accounting
 - Tracks inventory & capital item values
- More frequent than end-of-year
- Forward looking as for upcoming harvest

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B. Better capital asset management

- Much of farm's assets are land & machinery
 - Land's value much more than agriculture
 - Machines are high dollar items
- But, knowing when to own capital assets and when to hire services is equally important

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C. Improved production data management and analysis

- What do you do with reams of yield monitor or individual animal data?
- Do you know the profitability of individual fields and farms?
- Do you have the ability to perform and interpret on-farm research?

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D. Better day-to-day decisions on complex issues

- Crop insurance is an example
 - Many policies and choices
 - Talking to neighbors won't cut it
- Land rental agreements is another example
 - New rotation and tillage programs complicate
 - Land rents can deviate by:
 - Soil fertility
 - Field size & shape and access
- Need to be able to objectively and numerically analyze decisions
 - "Management by numbers"

55

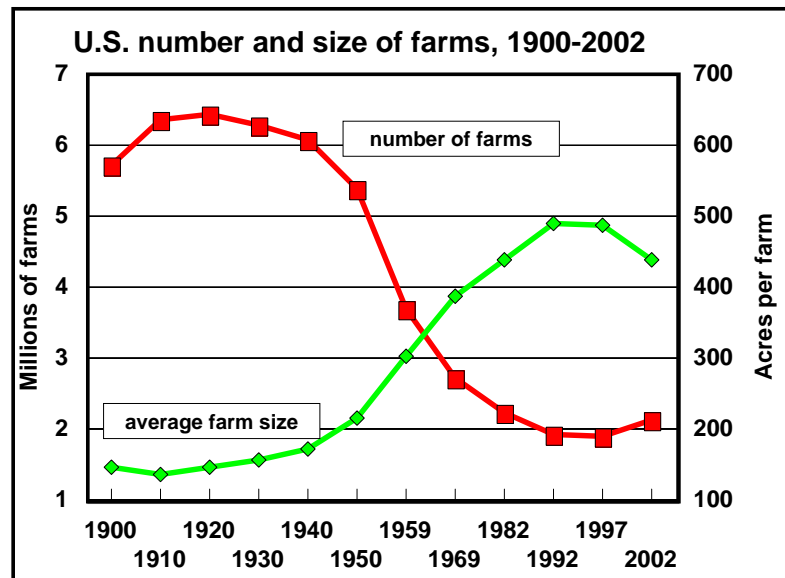
Getting an edge with more paperwork

- Office work must be valued
- The world runs on computers
 - Get yours running and keep it that way
 - Businesses underestimate cost of support
- The world runs on spreadsheets!
 - You or someone you're close to better understand

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1. Consolidation

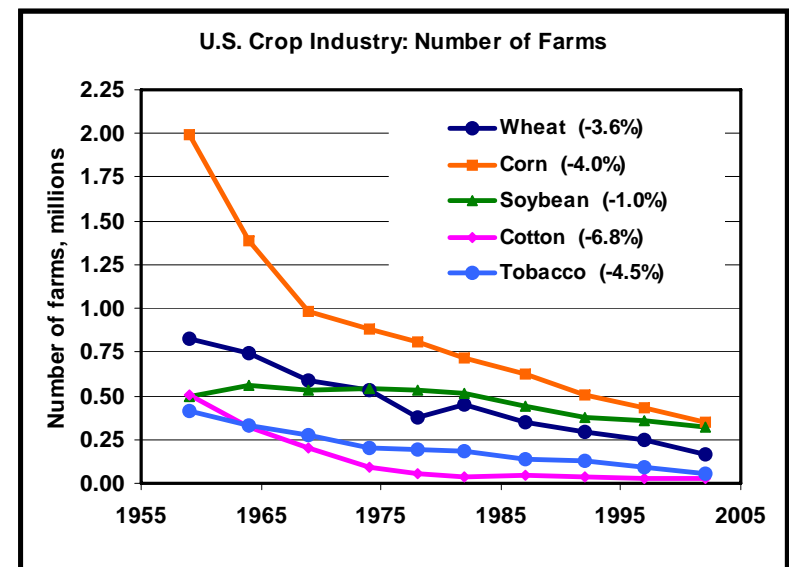
- The same or more business conducted by fewer firms
 - Cars started with Ford, numerous by 1940's, consolidated by 1970's
 - Many dry goods retailers, now Walmart
 - Currently mostly JD, CNH, and AGCO in the U.S.
 - Fewer packers, cattle feeders, dairies, swine operations, and crop farms
 - But also fewer lenders, machinery dealerships, grain elevators, and crop/livestock input providers
- Driven by economies of size



Source: Census of Agriculture

59

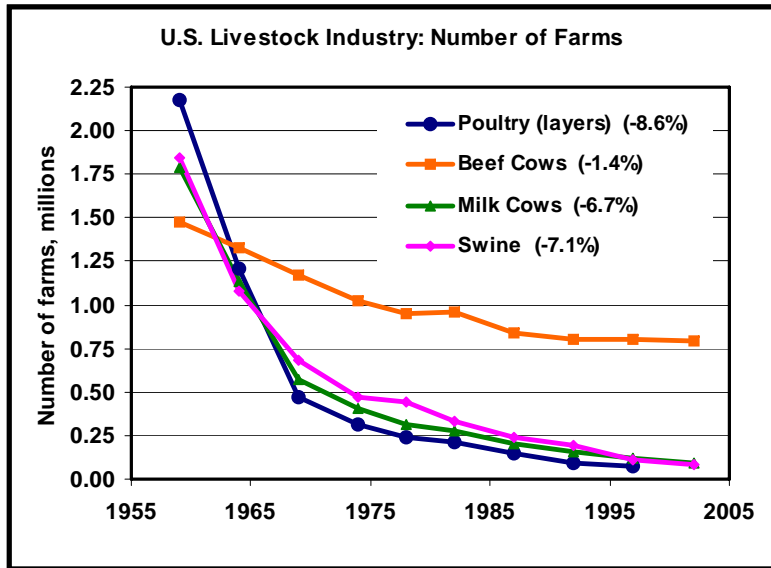
Trends in crop farm numbers . . .



Source: Census of Agriculture

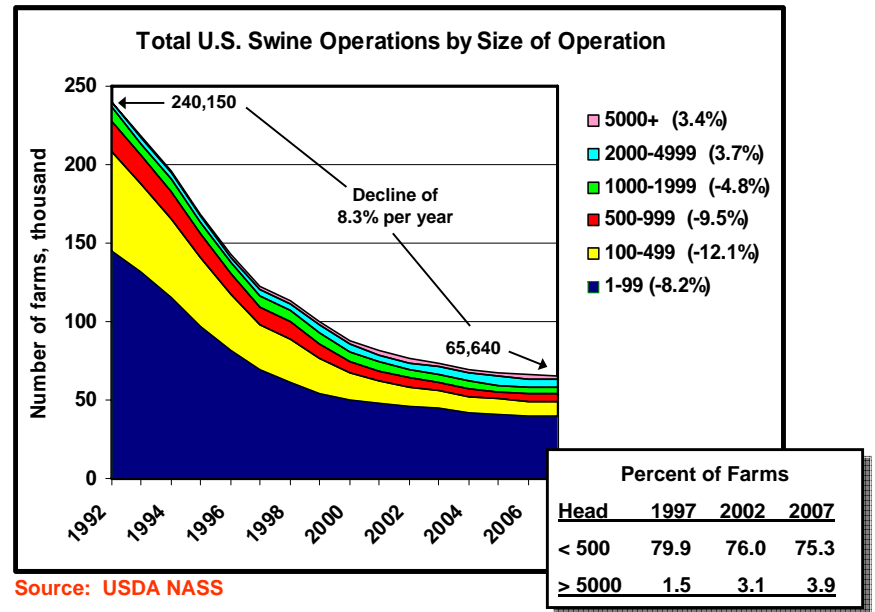
61

Trends in livestock farm numbers . . .



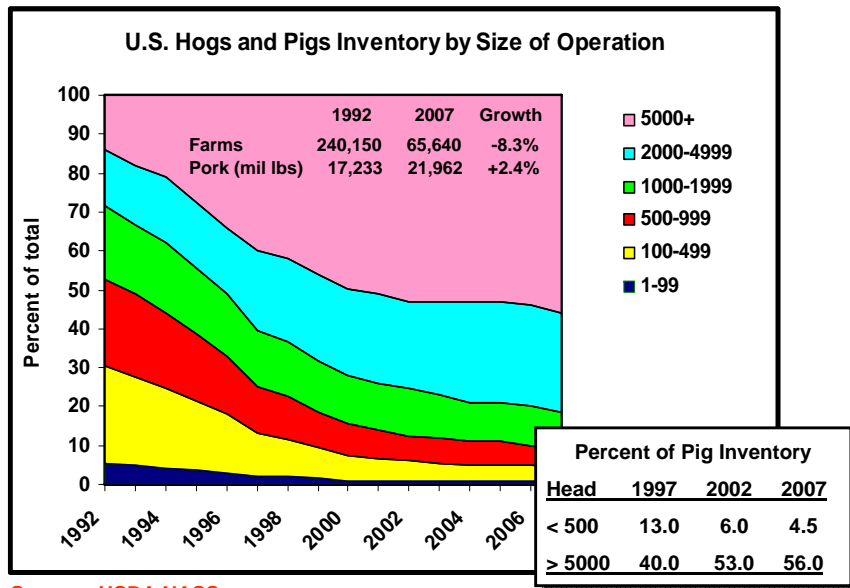
Source: Census of Agriculture

Rapid change in swine industry over last 15 years...



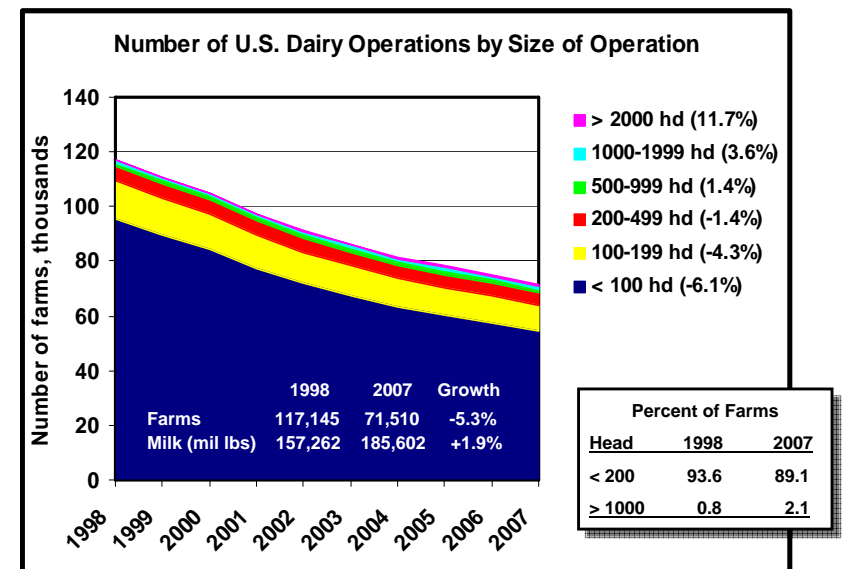
Source: USDA NASS

But, pork production has not decreased...



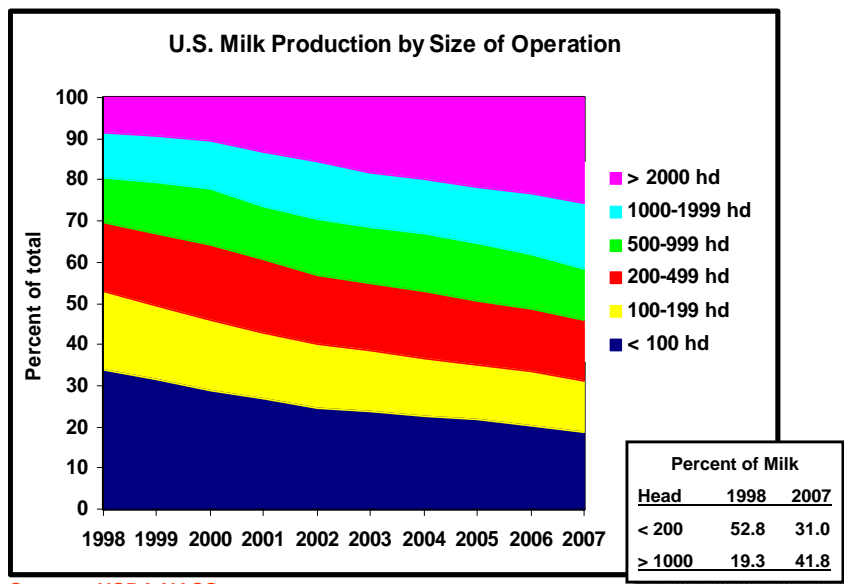
Source: USDA NASS

Dairy industry is looking a lot like the swine industry



Source: USDA NASS

Consolidation in dairy is happening...



Source: USDA NASS

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Concentration of U.S. animal agriculture in 2007 (production from approximately 10% of operations)

	Size of operation (hd)	Percent of operations	% of I, M, or P*
Beef cows	100+	10.3%	53.7% (I)
1000+ head Feedlots**	24,000+	8.6%	60.7% (M)
Dairy	200+	10.9%	69.0% (P)
Swine	2,000+	11.8%	81.5% (I)

* I = Inventory, M = Marketings, P = Production

** Feedlots with 1000+ head represent 2.4% of all feedlots and account for 86.1% of marketings (2006 data)

Source: USDA NASS and K-State

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Will consolidation in crop production speed up?

- **Farm machinery:**
 - More like a fixed investment in factory facilities
 - Sophisticated, expensive, for round-the-clock use
- **People:**
 - Skills required are becoming more specialized
 - often requiring different people (like other businesses)
 - Management becomes fixed cost
 - Business continuity means a management team
 - even larger fixed cost
- **Remember, we never saw the rapid consolidation in poultry, swine, and dairy coming either**

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Implications of consolidation

- **Fewer companies, not fewer choices**
 - Product differentiation is a natural outcome
 - Few brands but many classes and features
 - Few grain buyers but many marketing packages
 - Few bankers but many loan/interest rate packages
- **Transactional (market) price less informative**
 - **Must improve people skills**
 - Farm managers will need to establish interpersonal relationships with other farm managers, so that reliable information on product prices, features, and availability can be gained through communication and consensus.
 - **Think of partners, not competitors!**

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2. Technology

- Early adopters get the profits
 - Bid into cash rents and land values
 - Higher rents mean higher costs and non-adopters find themselves going broke in the face of rents they perceive as “too high”
- Speed of adoption depends on:
 - A) magnitude of expected profitability
 - B) degree of confidence in the expected profit
 - C) size of investment



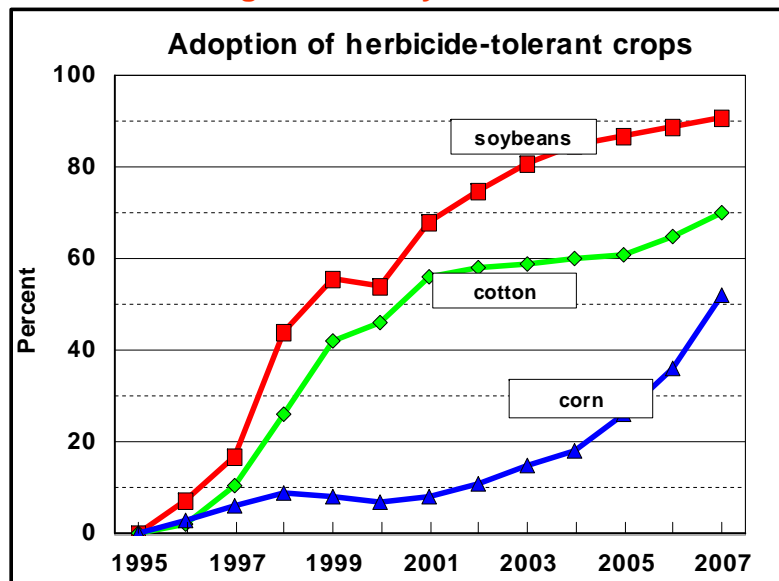
81

Technology: speed of adoption

- Big and obvious gains probably non-existent
- Small, obvious, gains along with small investment implies fast adoption
 - “belly-button” or “duh” technologies
 - Roundup-Ready soybeans

82

Some technologies are fairly obvious . . .



Source: USDA/ERS

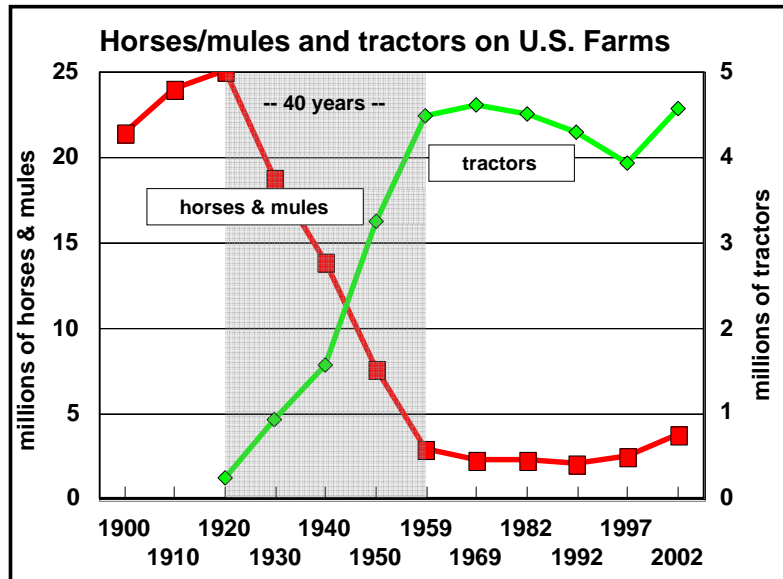
83

Other “duh” technologies (most farms)

- Lightbars (GPS guidance)
 - Gains against overlap and marker alternatives are easy to assess
 - Do take a little more investment so less adopted by small farms
- Tractor cabs
 - Hard to measure gain in \$ but know it’s there
- GPS-assisted steering
 - Larger investment than lightbars but still easy to measure advantage
 - Aspects like tractor cabs (reduces stress)

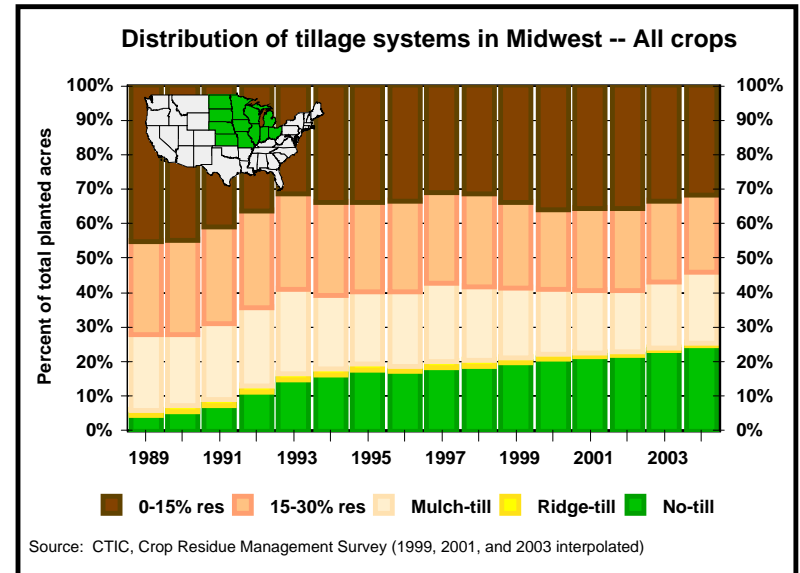
84

Some technologies aren't so obvious . . .



Source: U.S. Census of Agriculture

Some technologies aren't so obvious . . .

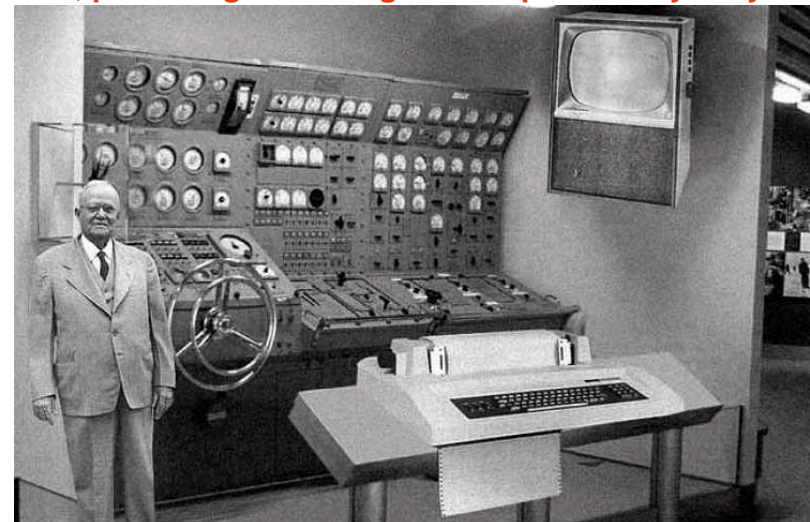


Midwest covers much of Corn Belt (much wetter climate)

Technology: how to get an edge

- Invest in the “duh” technologies quickly
 - You don't have a choice
- Invest in the slow moving technologies
 - The profits will last for years
- Invest in technologies that DO NOT save labor
 - Most people do not; hence the gains last for years

But, predicting technologies isn't particularly easy . . .



Scientists from the RAND Corporation have created this model to illustrate how a “home computer” could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.

Popular Science, 1954

3. More connections with non-ag

- More opportunities for non-farmers to invest on-farm (e.g., landowners)
- More opportunities for farmers to sell services to non-farmers (e.g., lease hunting)
- More opportunities for farmers to invest off-farm (e.g., ethanol)
- Increase need for analytical abilities and people/communication skills

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Land plays an especially interesting role in connecting ag and non-ag worlds

Understanding this connection is critical to successful farm management

95

Returns to land

- Capital gains (growth)
- Cash returns (rent)
- The two returns to land are similar to other investments such as the stock market (capital gains and dividends)

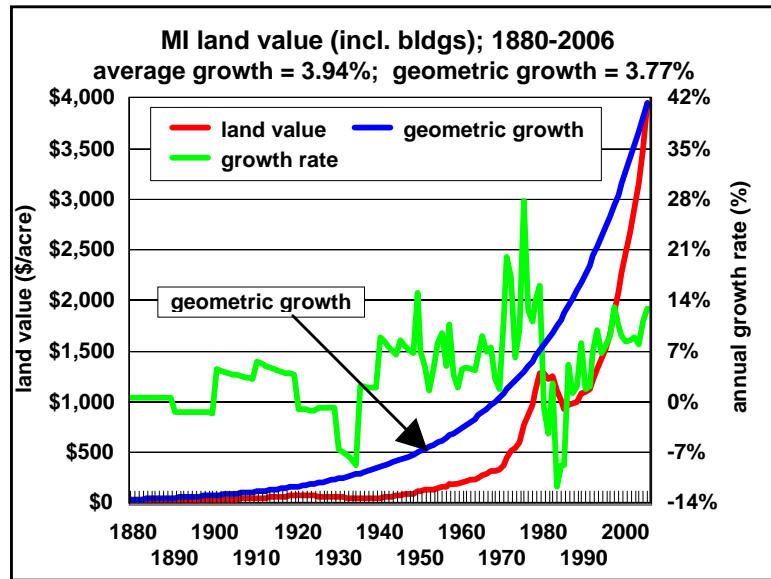


Factors/issues impacting land values

(alphabetical order)

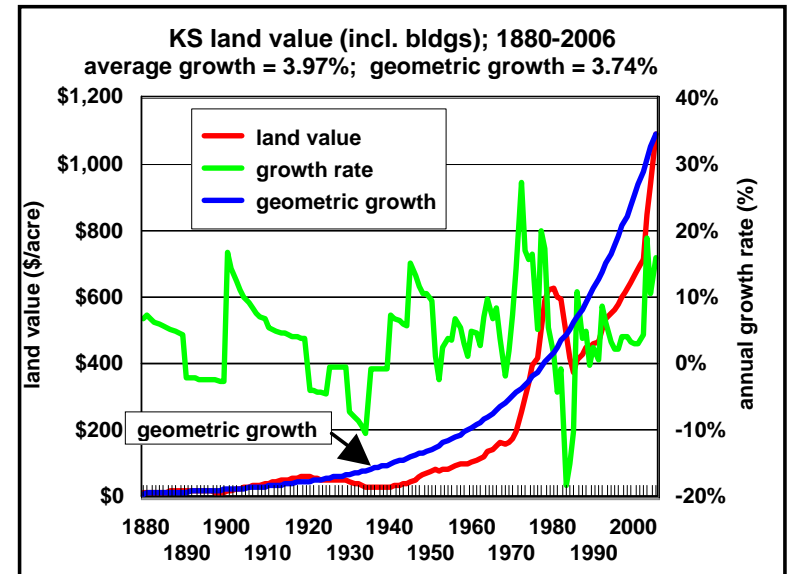
- Farm profitability
- Farm size
- Government programs
- Input costs (e.g., fuel and fertilizer)
- Interest rates
- Outside investors (i.e., stock market money)
- Recreation uses (e.g., hunting)
- Renewable fuels (ethanol and bio-diesel)
- Section 1031 tax exchanges
- Technology (e.g., no-till, precision ag, bio-tech, DNA)
- Urban sprawl
- Weather (i.e., drought, flood)

98



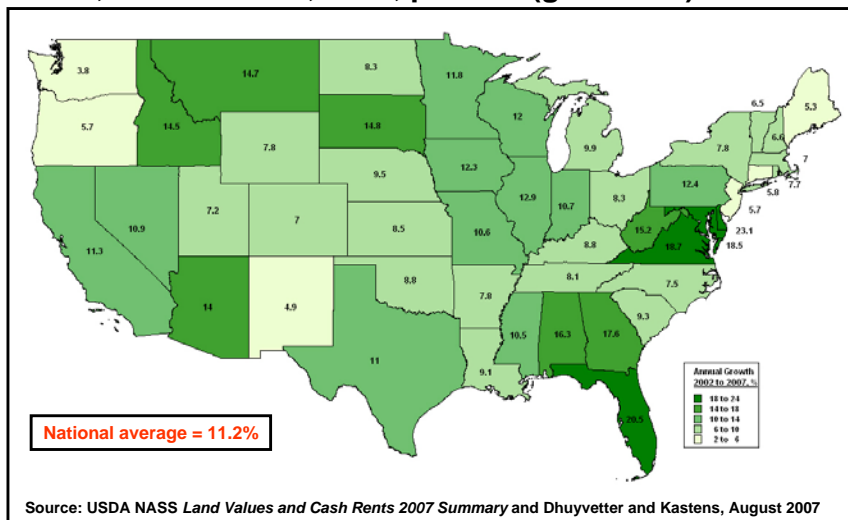
99

Kansas and Michigan land value growth rates are similar

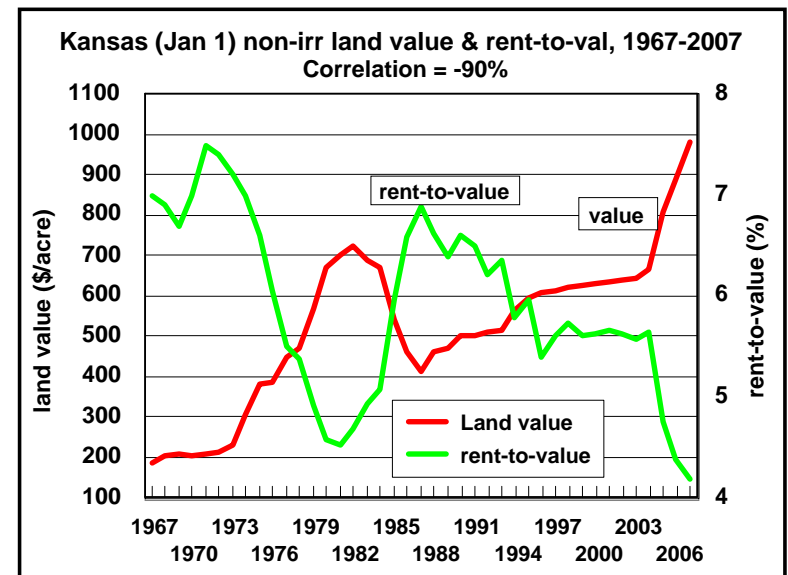


100

Crop Land Average Annual Growth Rate Jan 1, 2002 to Jan 1, 2007, percent (geo mean)

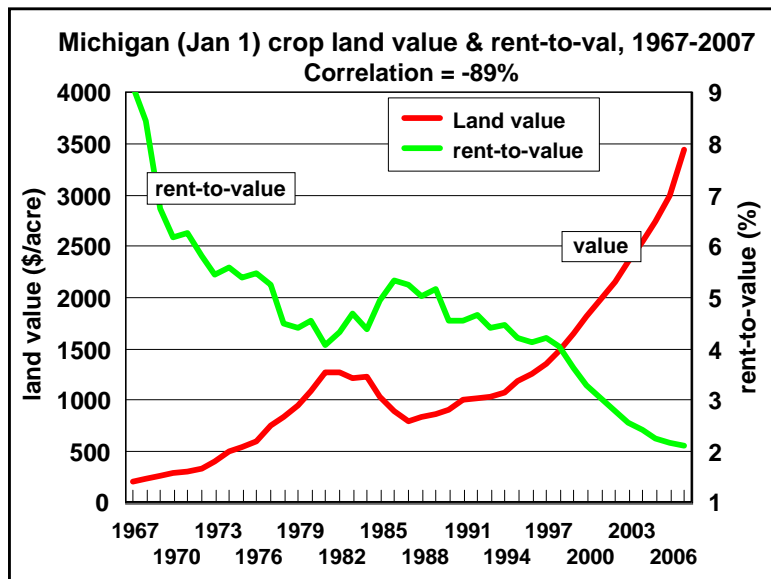


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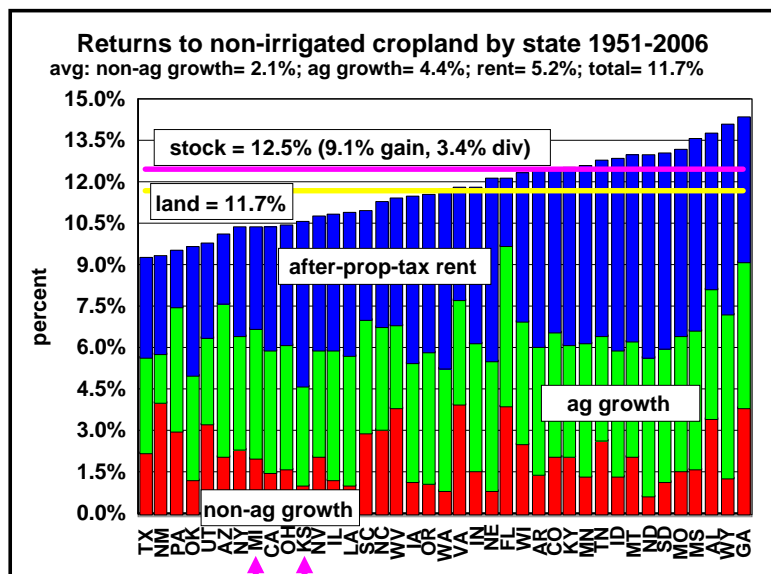
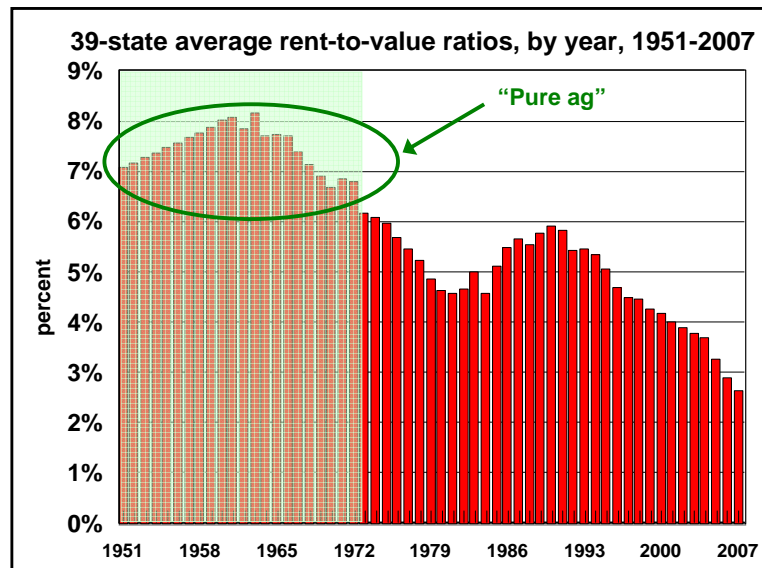


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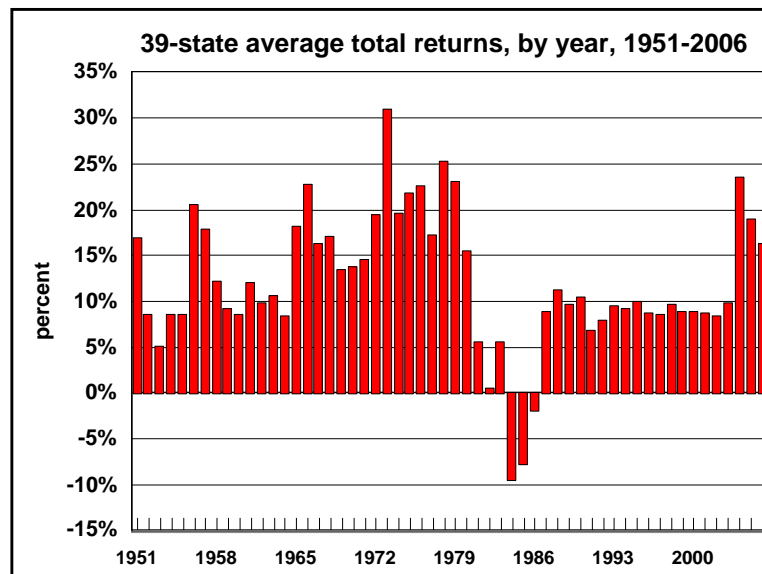
Steep decline in rent-to-value ratios in Michigan over time



Is this trend sustainable?

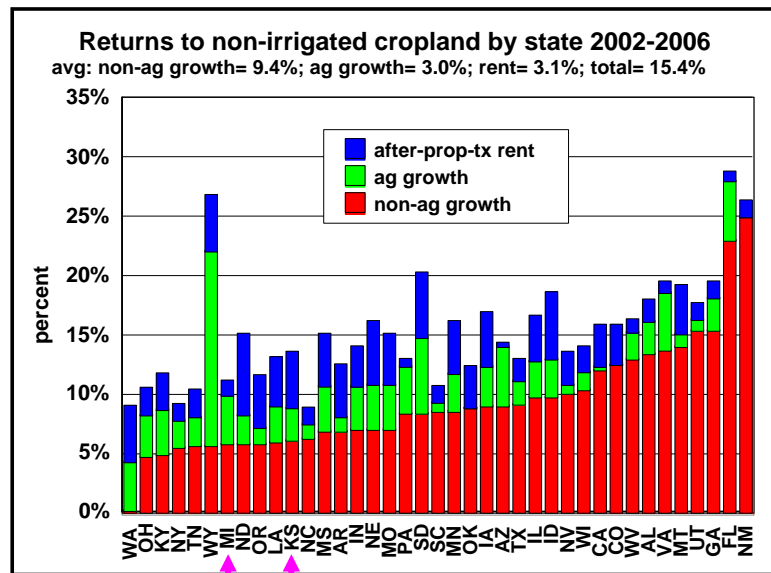


39 states ranked by total returns to land



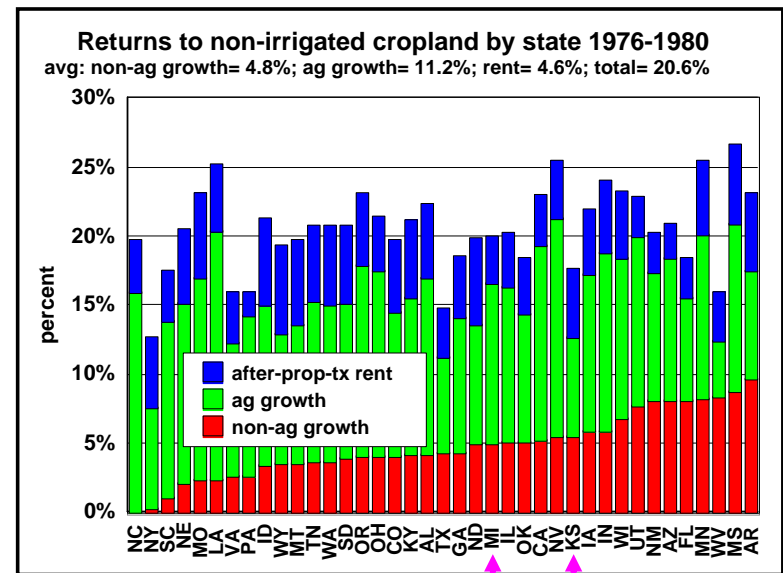
Is the "bubble" ready to burst? Not, based on all past run-ups.

Will the next 5 years look more like this?



Non-ag growth much more important lately; total returns reasonably good

... or, will it look more like this?



Dominated by growth in ag rents (inflation); total returns very high

Agricultural Market Value of Agricultural Land

- Based on the idea of an ag cap rate
- Used average after-property-tax RTV 1951-72
 - Early on while ag still is dominant
 - Before wild inflation of the 1970's
- Michigan ag cap rate = 5.46%
- Kansas ag cap rate = 6.64%
- 39-state average cap rate = 6.57%



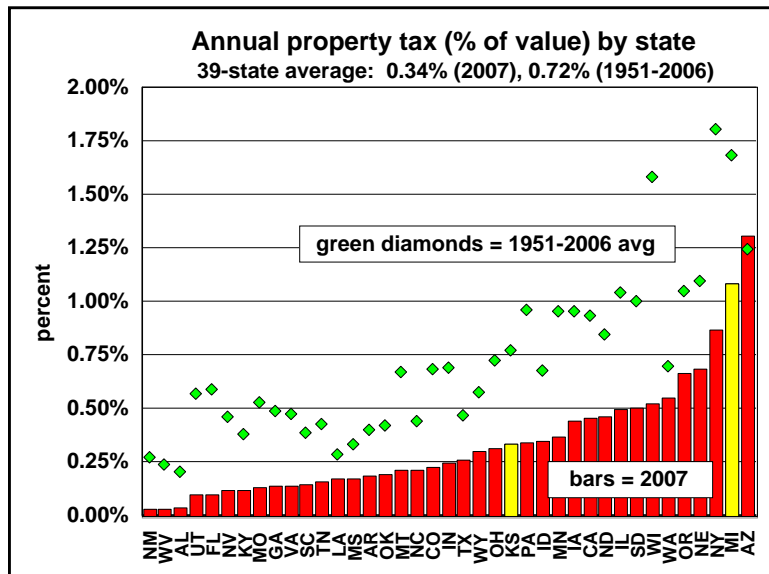
Agricultural Market Value of Agricultural Land using KS non-irrigated cropland as an example

- Jan. 1, 2007 land value = \$980 /acre
- Cash rent for 2007 = \$41.00 /acre
- 2007 property tax = \$3.27 /acre
- 2007 after-property-tax rent = \$37.73 /acre
- $\$37.73 / 0.0664 = \$568.22 /acre$
- AMVP (non-irr) = $\$568.22 / \$980 = 58.0\%$

Agricultural Market Value of Agricultural Land using MI cropland as an example

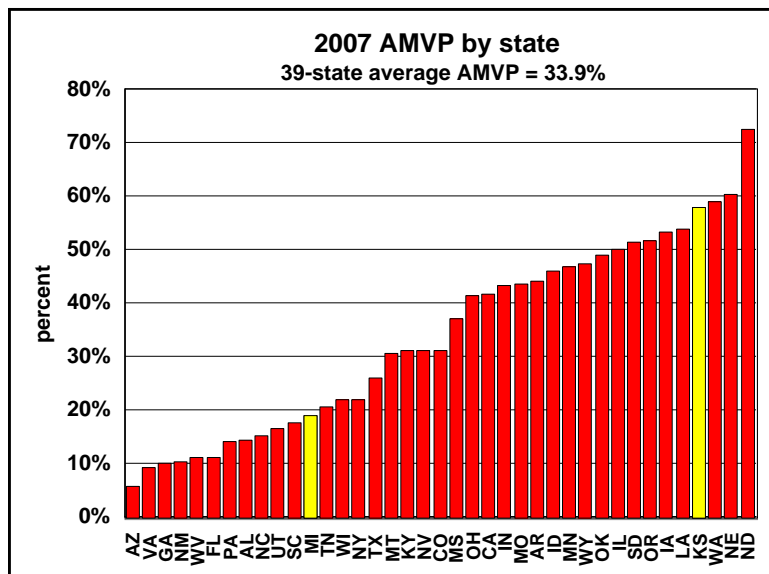
- Jan. 1, 2007 land value = \$3450 /acre
- Cash rent for 2007 = \$73.00 /acre
- 2007 property tax = \$37.38 /acre
- 2007 after-property-tax rent = \$35.62 /acre
- $\$35.62 / 0.0546 = \$652.38/\text{acre}$

- $\text{AMVP} = \$652.38 / \$3450 = 18.9\%$



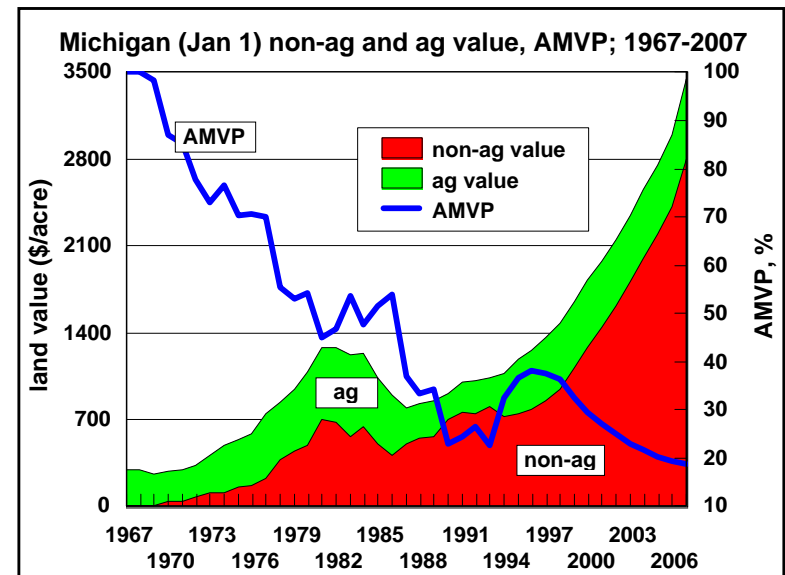
118

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percent of land value that is due to agriculture

123



Using after-REtax AMVP calculations

125

Is land a good investment in Michigan?

- Depends more on the non-ag world than the ag world
- Regardless, it will tie up a lot of equity that you may need for other farm expenditures
- Why do you want to own land anyway?
- Is outside investment good or bad?

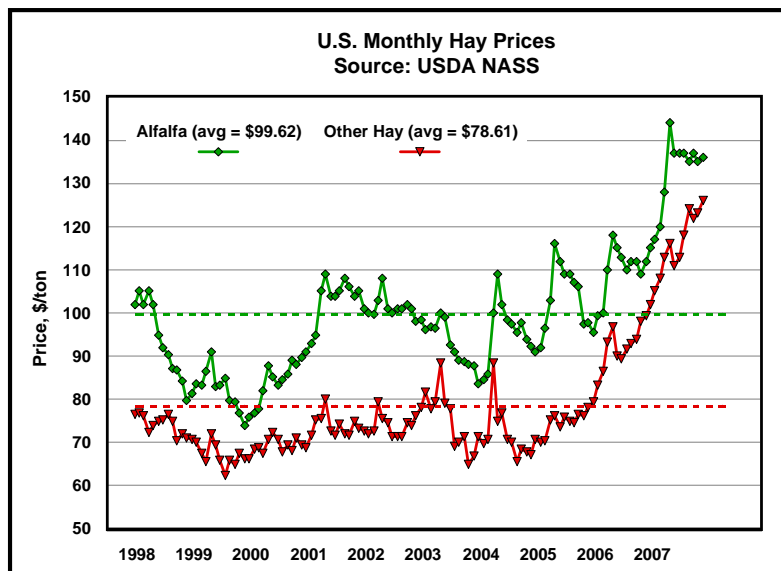
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Result of ethanol push is higher commodity prices

Higher crop prices lead to higher land rents

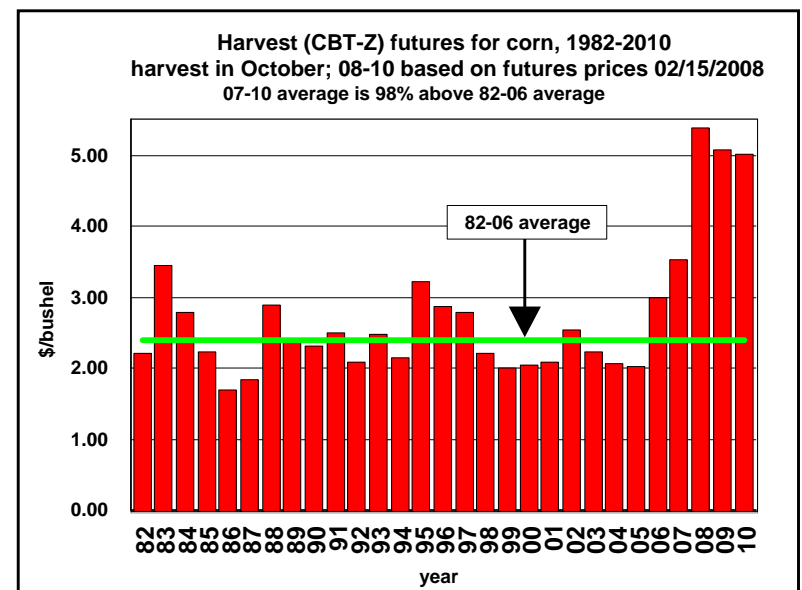


It's not just grains...



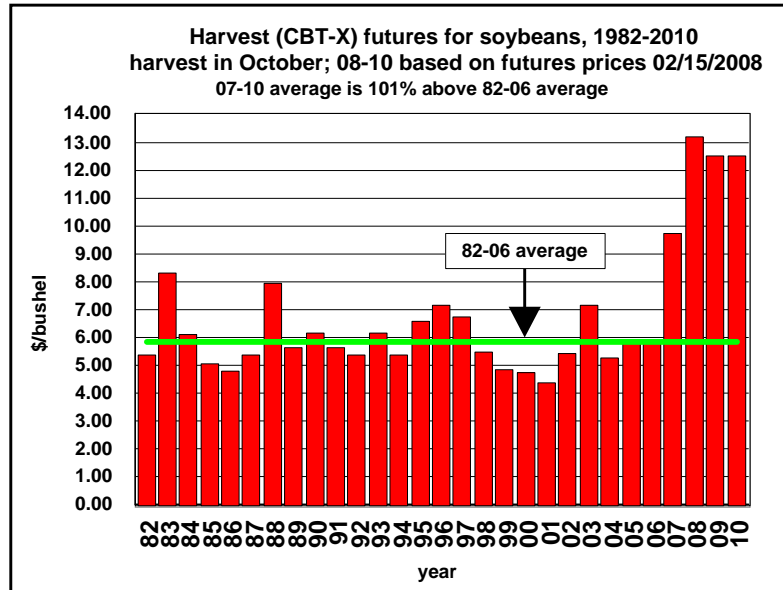
145

How long will strong prices stick around?



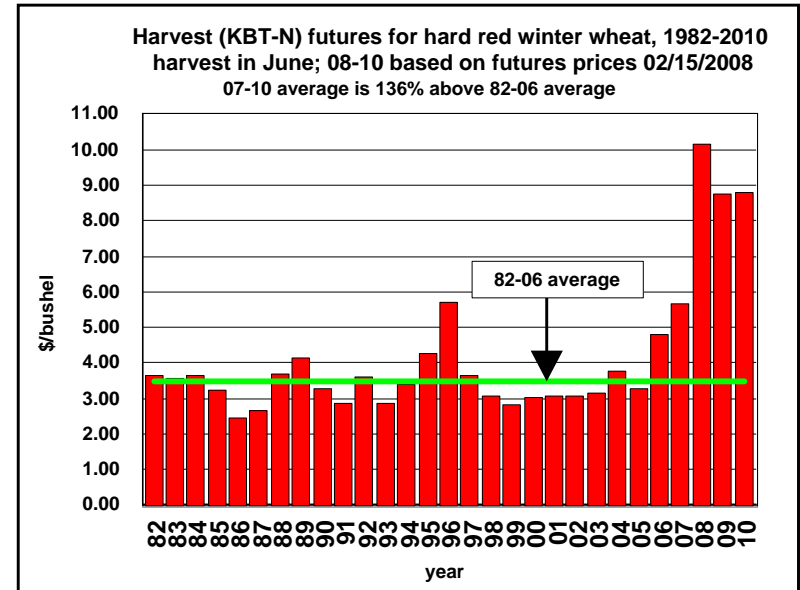
146

How long will strong prices stick around?



147

How long will strong prices stick around?

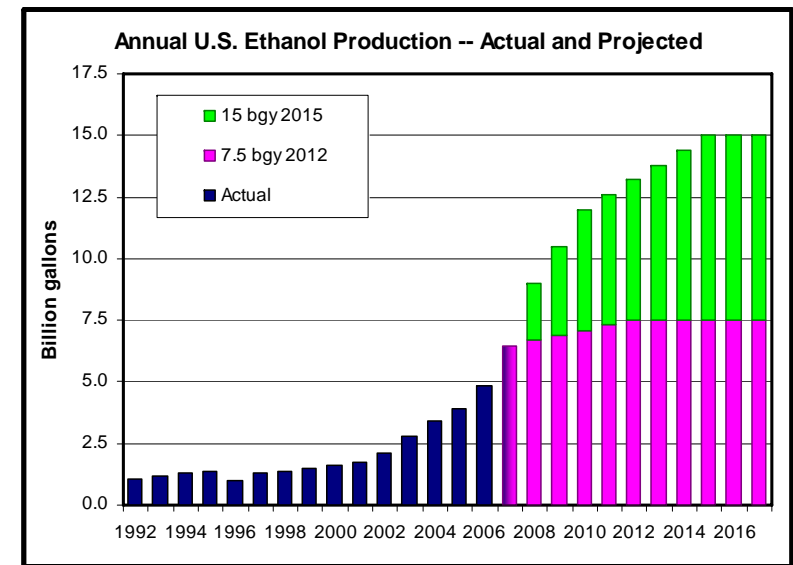


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Future ethanol production . . .

- Not sure whose crystal ball to believe
 - Today's 7 bgy easy to sustain; next 7 bgy reasonable over time; beyond ???
 - Hard to predict politics
- Impact of cellulosic ethanol
 - Maintaining SOM will allow only 6.5 bgy from corn stover; alternatives will be slowwww
- Most predictions in the 11-15 bgy over the next 3-5 years
 - Reflects current actual + planned capacity
 - Approximates E10 nationwide
 - Consistent with current Energy Bill mandate

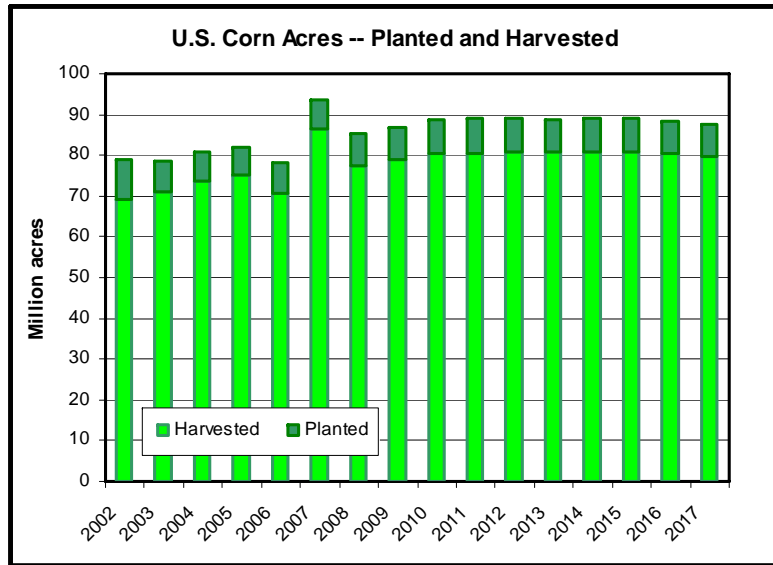
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Projections based on levels in Energy Bill (December 2007)

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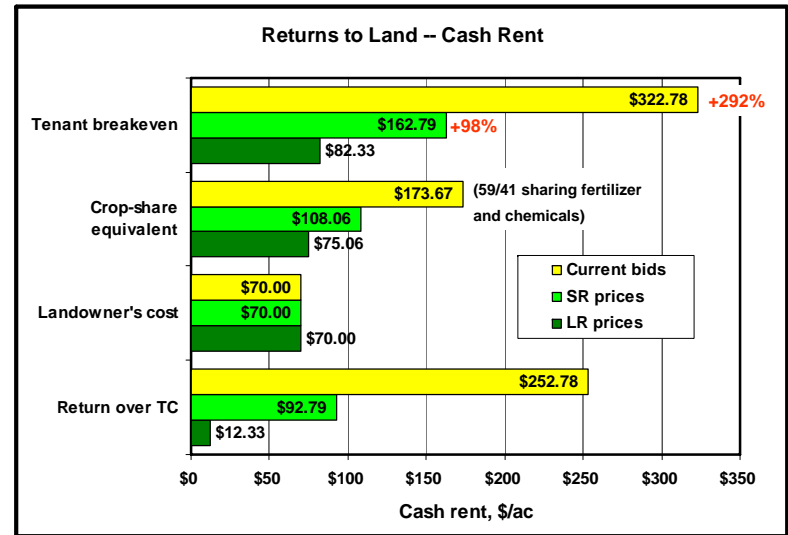
Yield growth does not quite cover corn needs in short term...



Source: 2002-07 USDA, 2008-2017 KSU projections

Estimated cash rents for Northeast Kansas

(alternative price scenarios)



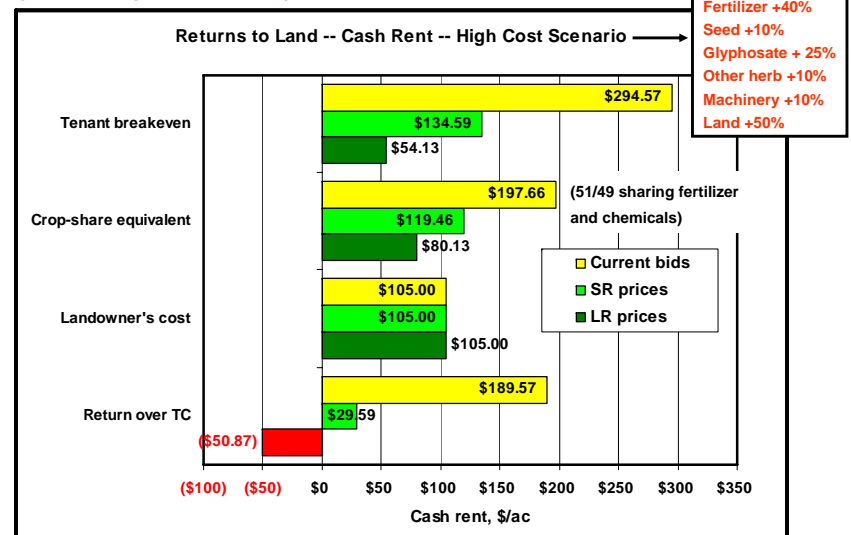
Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at www.agmanager.info)

Really high rent potential . . .

- Previous example suggested that price increases of 32% to 97% could mean a rent increase of 98% to 292% (elasticity of 3.0)
- 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

Estimated cash rents for Northeast Kansas

(alternative price scenarios)



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

KSU study of impact of high commodity prices on rental rates



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A KSU study of three scenarios

- Scenario 1 – baseline (no ethanol)
 - Historical average growth rates of corn yield and price drive rents, which drive land values
- Scenario 2 – ethanol comes and stays
 - Corn price grows rapidly to new plateau by 2010, then follows normal growth thereafter
- Scenario 3 – ethanol comes and leaves
 - Corn price grows rapidly to new plateau by 2010, then falls back to growth path that would have occurred without ethanol

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Assumptions in KSU study

- Growth in corn yield and price determines rent growth
 - Yield grows at historical (1950-2007) rate in all
 - Price grows at historical rate in baseline but different rates in other two scenarios
- Rent growth assigned to ag portion of land
- Non-ag portion of land value grows at 3%
- Miscellaneous assumptions:
 - start 1/1/06; 30-year land ownership analysis (show 12 years)
 - interest = 7%; income tax rate = 25%; cap gain = 15%
 - property tax = 1.0% of land value (for Michigan)
 - 2010-to-2006 price ratio with ethanol is 1.50
 - starting rents, values, crop prices from USDA-NASS

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A KSU study in January 2008 (Kastens & Dhuyvetter)

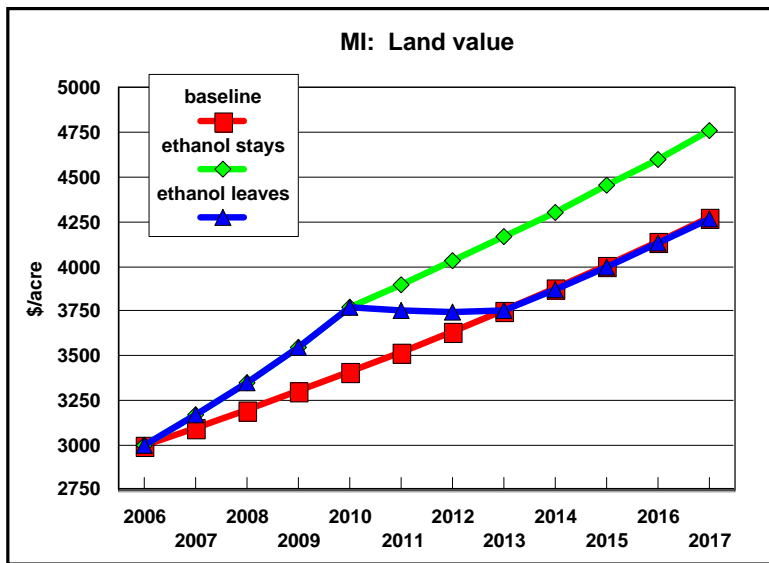
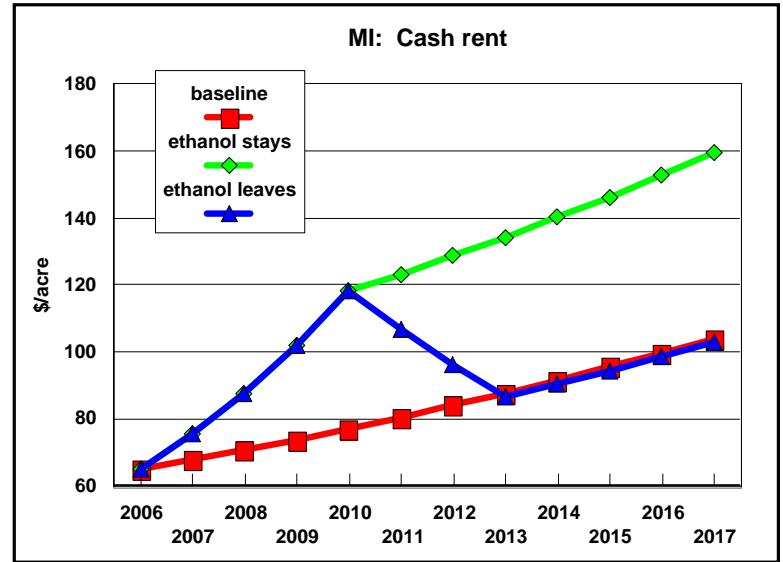
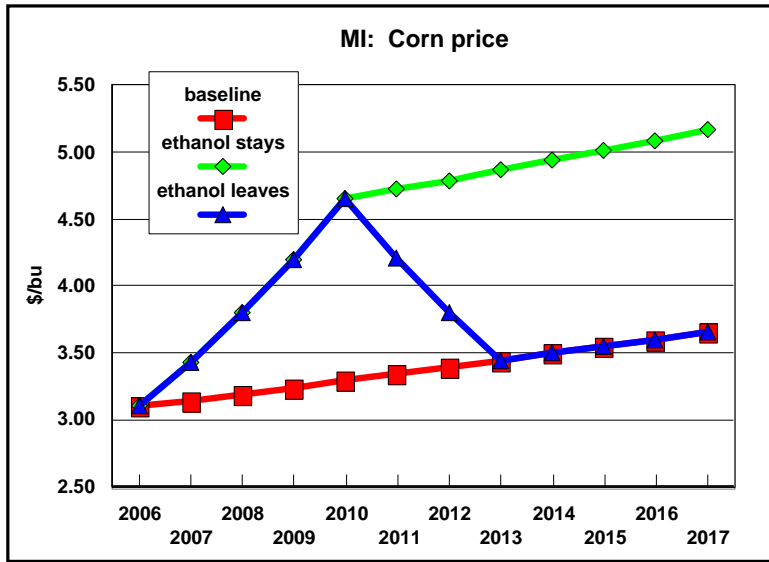
state	a 1% change in corn revenue i.e., yield or price, leads to a change of this % in rent	1950-1972 avg pre-REtax rent-to-value ratio (ag cap rate, %)	2007 % of land value due to agriculture	1950-2007 avg ann. growth rate in %, for non-ag land value	1950-2007 avg ann. growth rate in %, for corn yield	1950-2007 avg ann. growth rate in %, for corn price
KS	0.76	7.78	57.98	11.17	3.15	1.58
MI	1.26	6.62	18.93	14.71	1.94	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:

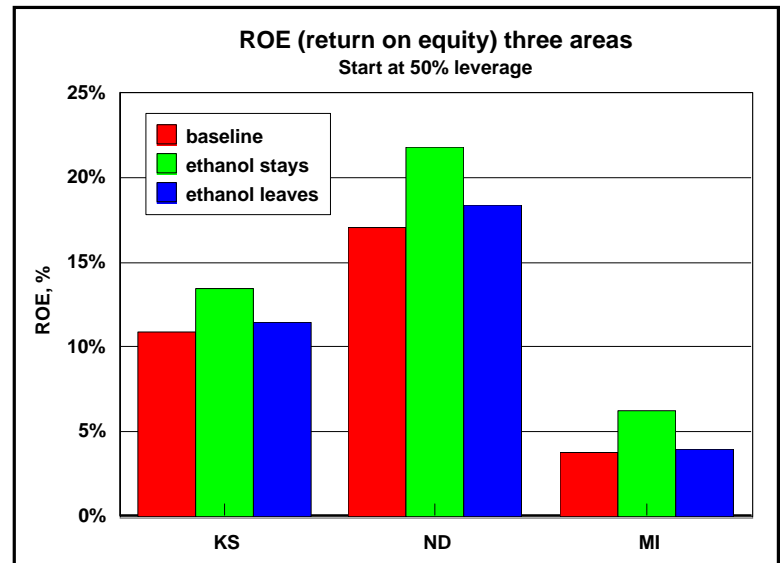
Results don't materially change if use w wheat or soybeans in analysis.
 Most mathematical models explained 85 to 95% of variation in dependent variable.
 Rent/(ag cap rate) equals agricultural portion of land market value.

AL and ND included as examples of high and low non-ag influence
 . . . But MI itself is a pretty good example of high non-ag influence

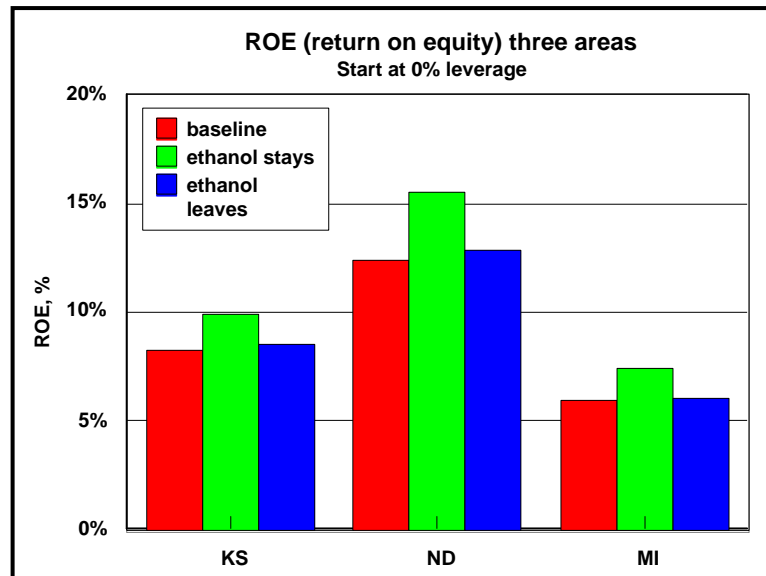
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Ethanol will be good to states like ND, which is dominated by ag



Even w/o leverage, MI land doesn't look especially attractive given assumptions



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Summary

- Consolidation is here to stay: embrace it!
- Profits go to technologies' early adopters
- Be careful about value-added investment
 - Maybe do the reverse
- Be ready for more paperwork and computers
- Acquire specialized skills in-house or with consultants

- Develop better people skills – they'll be needed

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Summary

- Farm size and growth especially important
- Traditional one-family mid-sized farms:
 - A number likely will remain as one-generation farms
 - A large number will "become" small part-time farms
 - A number of operators will select another career
 - A few operators will become employees of large farms
 - A few will become large commercial farms
- Successful farms of the future will
 - Have increased equity requirements
 - Will not view debt as something to reduce
 - Think of labor as an investment in human capital
 - Will target growth rather than an optimal size
 - Will become corporate thinkers
- About what *will* be not what *should* be

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Summary

- Wealth and Time/Skills

- Know your comparative advantage

- It's all about happiness – enjoy what you do!

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Questions ???



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