



 **Future of Agriculture**
Economies of Size and Trends in Agriculture

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Not a “futurism” discussion . . .

- **Farming: profit or lifestyle?**
 - Conflicting or synergistic?
- **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)

Economies of size: the driving force

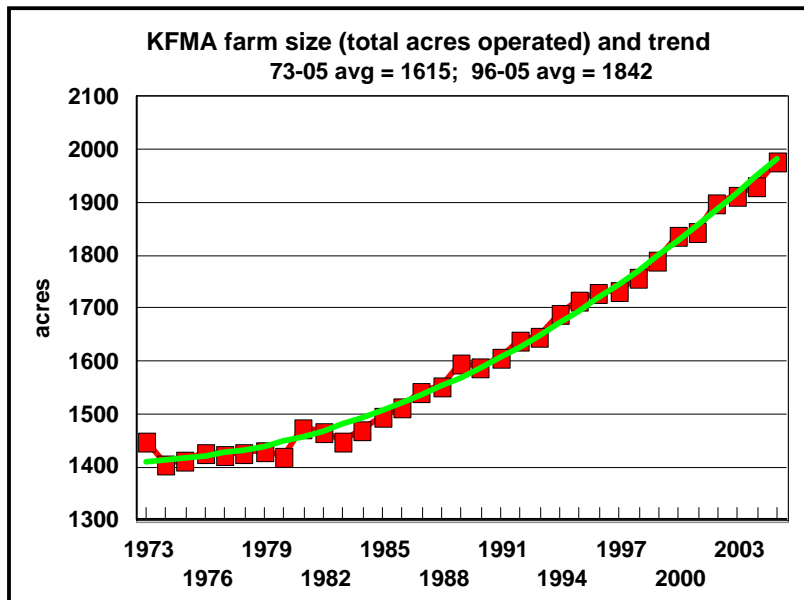
- **Per-unit costs fall as a firm gets bigger**
 - Essentially about spreading fixed costs
 - May mean higher prices instead

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Is EOS for real?

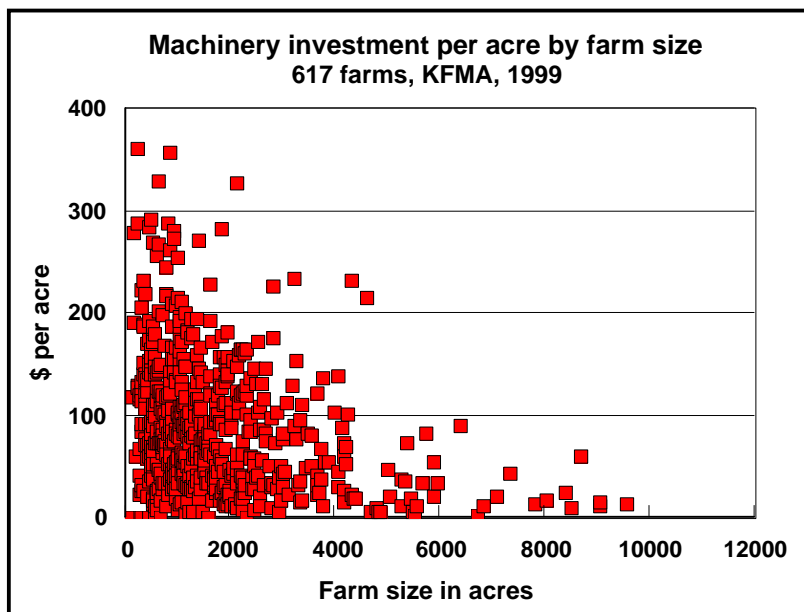
- **Is there a benefit to targeting growth and size?**
- **Or, is growth an accident of good management (plowing profits back into the farm or business)?**
 - Walmart: size, or a good retailing idea??
 - Why don't we observe numerous small packing plants?
 - Why don't we observe many small farms with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

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Farm size has been increasing at an increasing rate

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Large farms don't have as much invested in machinery

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Is EOS for real?

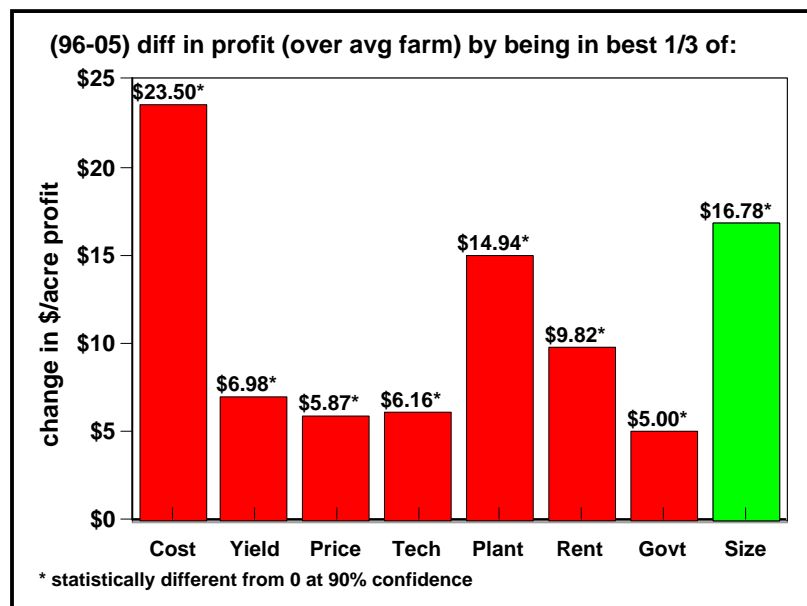
- **EOS doesn't mean you have to be big to be low cost**
 - Many small farms have low costs
 - But, it's harder to be low cost if you are small
 - EOS is an “on average” phenomenon
- **Little evidence of big, high cost, farms**
 - They've gone broke

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Is EOS for real?

- **Hard to distinguish effect of good management and other factors from 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?

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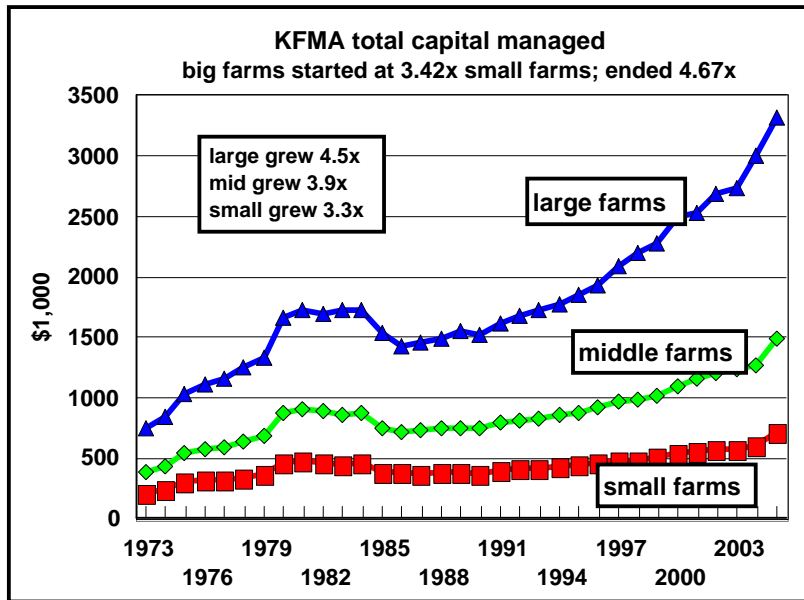
A size effect remains – evidence that EOS is for real

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Why are large farms more profitable?

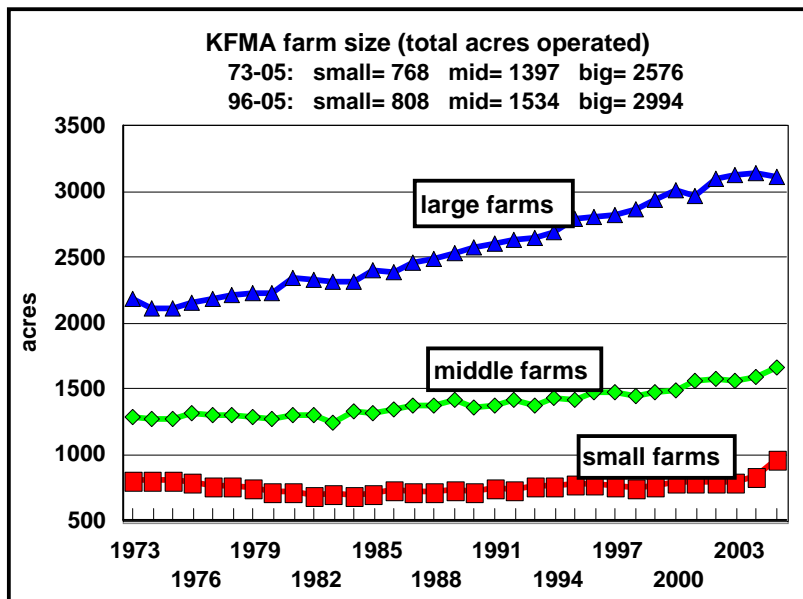
- Lower cost is the obvious benefit, but other benefits arise from the research
- Larger farms:
 - Have much lower costs
 - Get somewhat higher yields
 - Get slightly higher prices
 - Farm more intensively
 - Are much faster adopters of technology, for example, less-tillage

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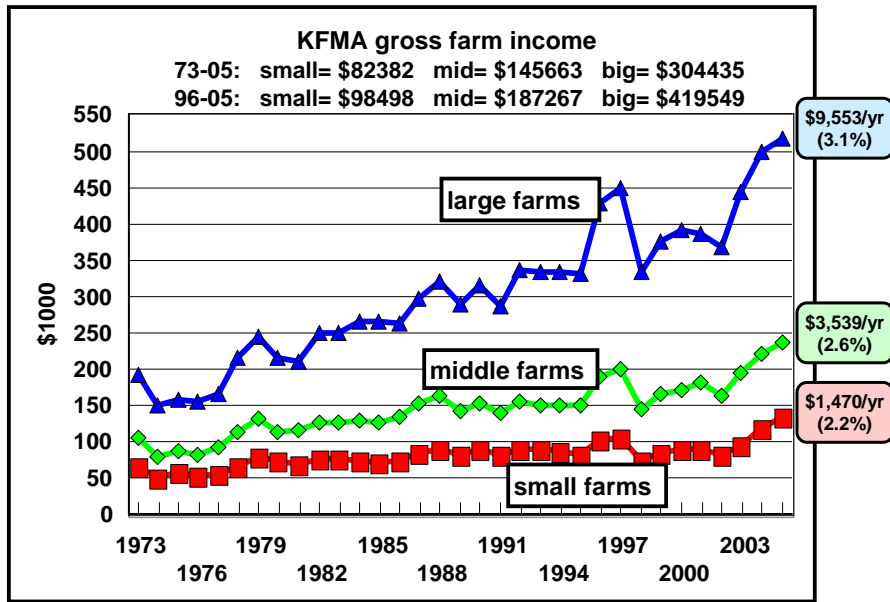


A portion of growth in \$ values is inflation

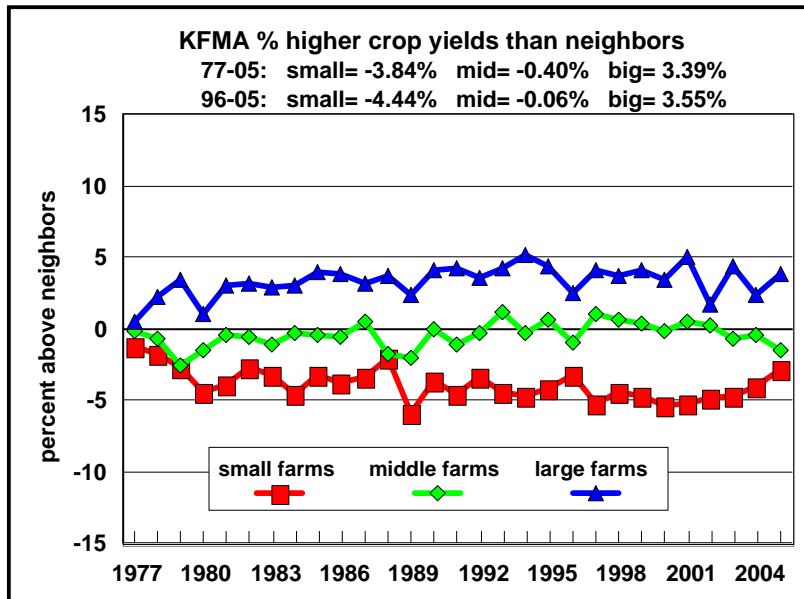
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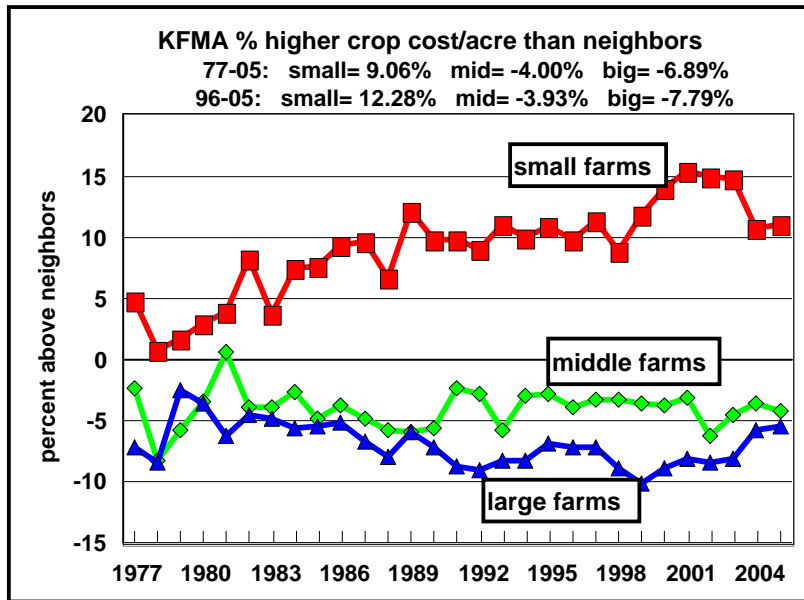


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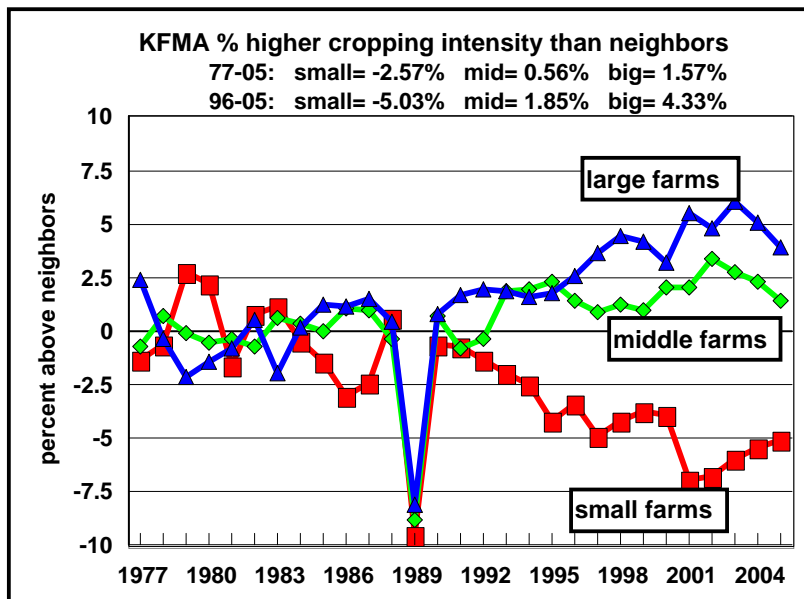


Even the "big" farms aren't all that big!



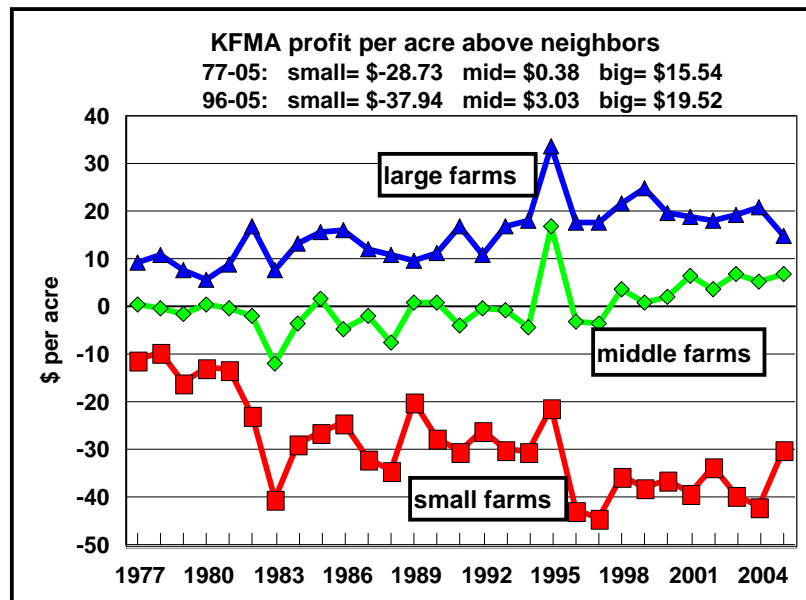


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Big and small really departing from each other in last 15 years

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The characteristic differences across farm sizes result in profit differences

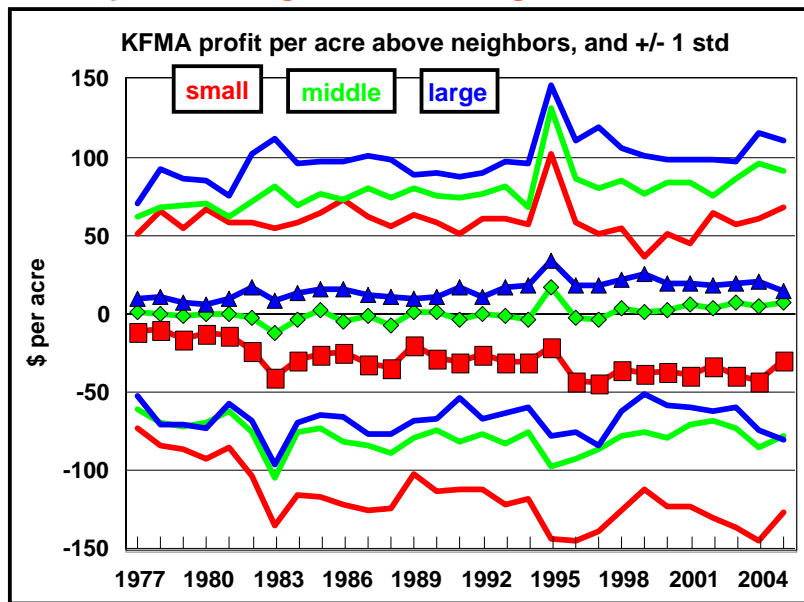
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Large farms are not only more profitable

- 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

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



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

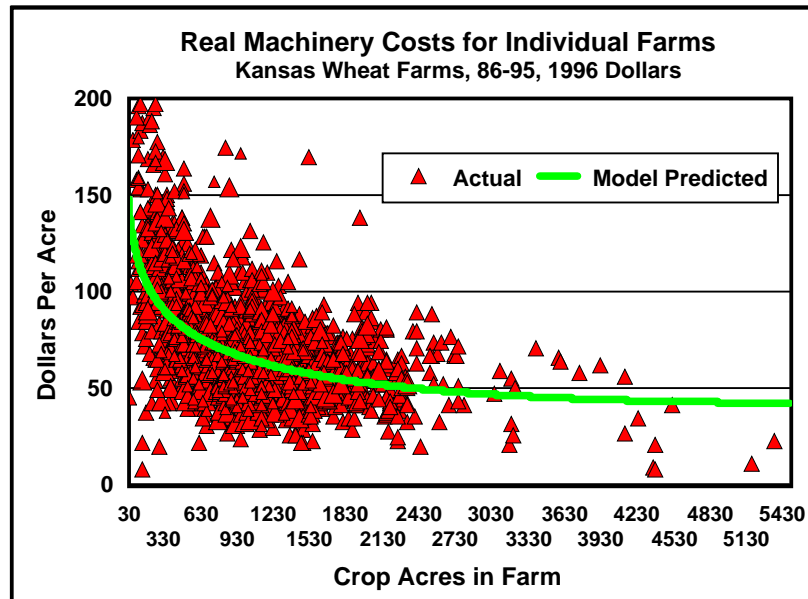
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What about growth?

- How important is it that a farm continues to grow?
 - EXTREMELY IMPORTANT
- Is it better to be an average-sized farm with high growth or a large farm with low growth?
 - AVG SIZE WITH HIGH GROWTH IS BETTER!
- Remember that farm size is not static
 - Average farms grow
 - Large farms that don't grow "become" small

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Do EOS turn to diseconomies at sufficiently large size?



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

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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Changing EOS features across farm size

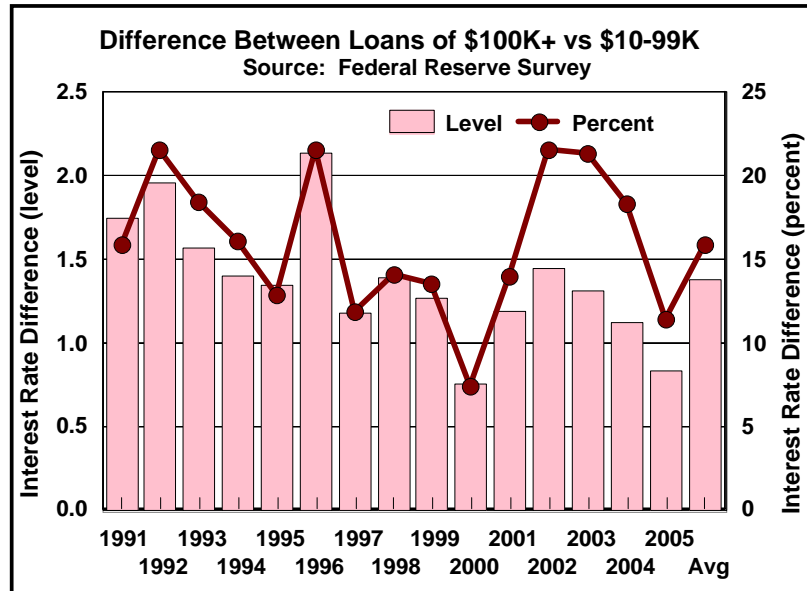
- **Labor first**
 - Labor is fixed and it pays to be fully employed
- **Machinery second**
 - Bigger machines are less expensive per unit of capacity

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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

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Bigger loans have lower interest rates

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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: equity

- **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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EOS implications: labor

- **Successful farms will be innovative**
 - A farming heir wants to hold onto the family farm
 - A growing farm needs good employees
 - **Rent the farm and hire the farmer**
 - The exiting farmer
 - saves face as a landlord
 - preserves the family farm
 - retains much of what he/she enjoys about farming
 - retains the place of residence
 - makes a smooth career transition
 - The growing farm
 - acquires an excellent employee with little training
 - grows the farm to capture EOS
 - **Think about painless transitions**

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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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Trends . . .

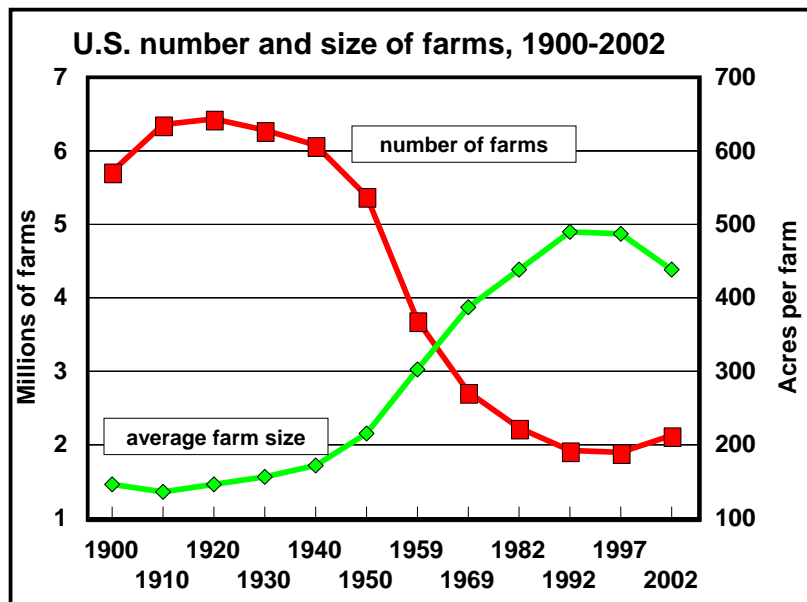
- 1. Increasing consolidation**
 - 2. Rapid technological change**
 - 3. Greater connections to the non-ag world**
 - 4. Increased computer work and paper work**
 - 5. More reliance on people with specialized skills**
- Trends go hand in hand with economies of size

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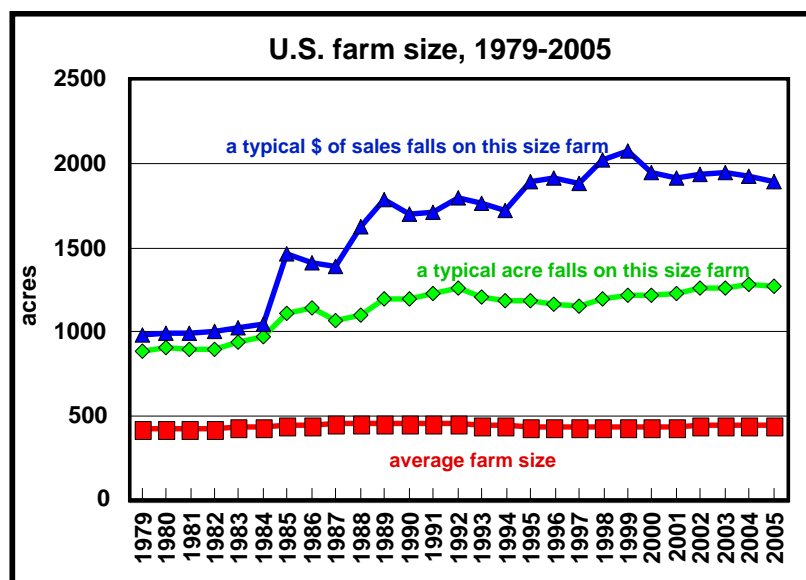
1. Consolidation

- **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 Deere and CNH in US
 - 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

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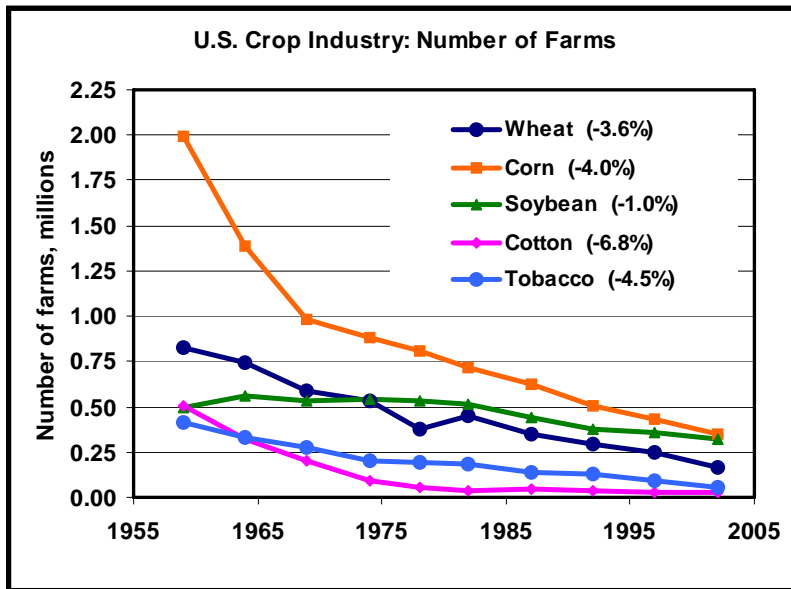


Source: Census of Agriculture



Based on KSU calculations from ERS / Census of Agriculture data

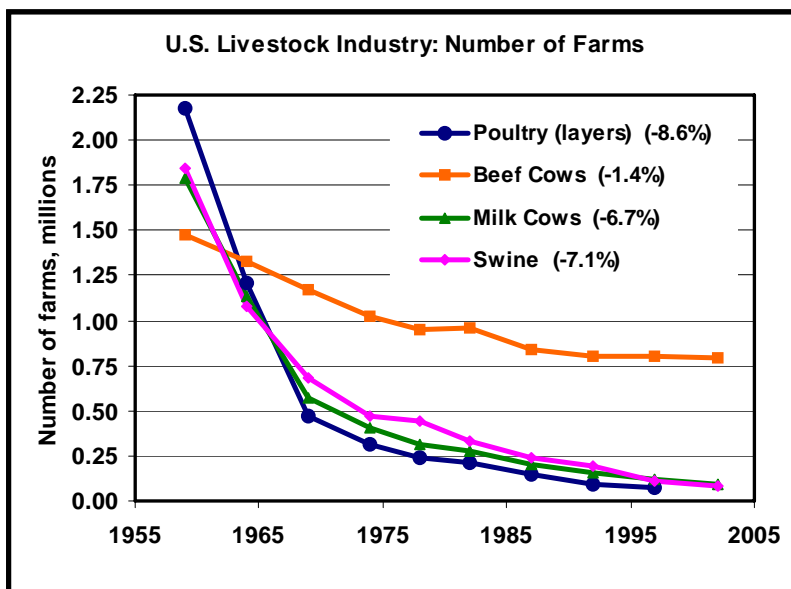
Trends in crop farm numbers . . .



Source: Census of Agriculture

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Trends in livestock farm numbers . . .



Source: Census of Agriculture

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Concentration of U.S. animal agriculture in 2005 . . .
 (production from approximately 10% of operations)

	Size of operation (hd)	Percent of operations	% of I, M, or P*
Beef cows	100+	10.2%	55.5% (I)
1000+ head Feedlots**	24,000+	8.4%	60.7% (M)
Dairy	200+	9.9%	64.9% (P)
Swine	2,000+	11.3%	79.0% (I)

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

** Feedlots with 1000+ head represent 2.5% of all feedlots and account for 86.0% of marketings

Source: USDA NASS and K-State

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Concentration of U.S. animal agriculture in 2005 . . .
 (percent of operations to generate approximately 50% of production)

	Size of operation (hd)	Percent of operations	% of I, M, or P*
Beef cows	500+	10.2%	55.5% (I)
1000+ head Feedlots**	32,000+	5.7%	50.0% (M)
Dairy	500+	3.9%	49.5% (P)
Swine	5,000+	3.5%	53.0% (I)

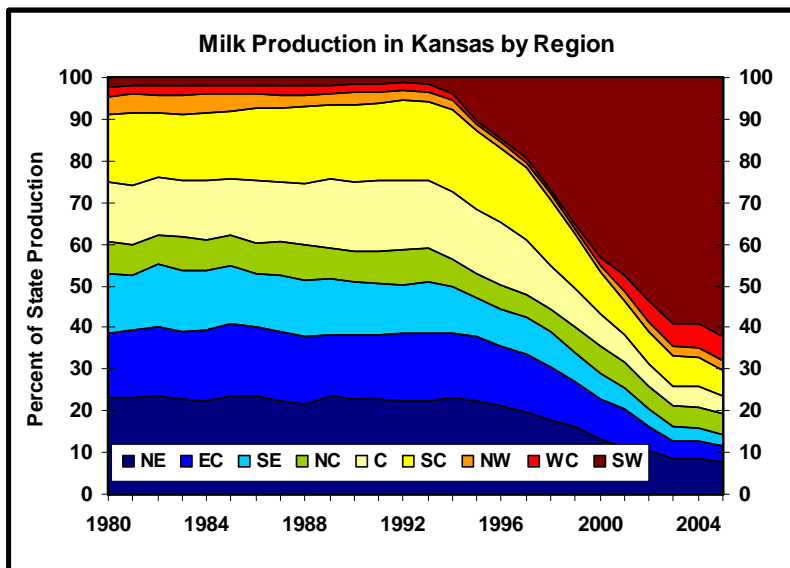
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** Feedlots with 1000+ head represent 2.5% of all feedlots and account for 86.0% of marketings

Source: USDA NASS and K-State

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Consolidation impacts “local” production . . .



Source: USDA NASS

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Consolidation in crop production

- **Tractors & combines becoming very complex**
 - Constantly variable transmissions
 - GPS-assisted steering
 - Automated hydraulic features
 - Increased size of equipment (e.g., 36' header)
- **Complexity means higher purchase cost**
 - Need more hours/acres to justify
 - Requires fewer tractors and combines today
- **Many other economies of size**

Implies consolidation may happen at an accelerated rate over time

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Rapid consolidation in crop production?

- **We don't know!**
 - But we really wouldn't have known for poultry, swine, and dairy 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.

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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

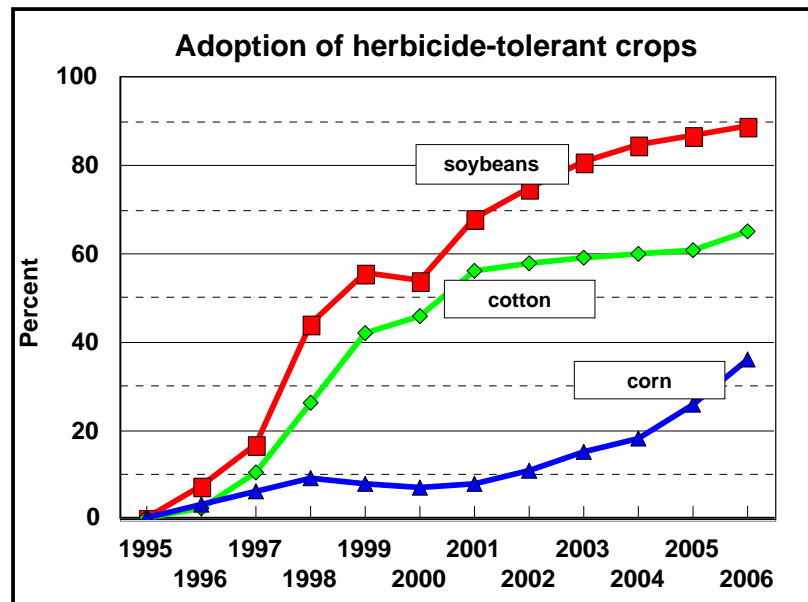
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Technology: speed of adoption

- **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

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Some technologies are fairly obvious . . .



Source: USDA/ERS

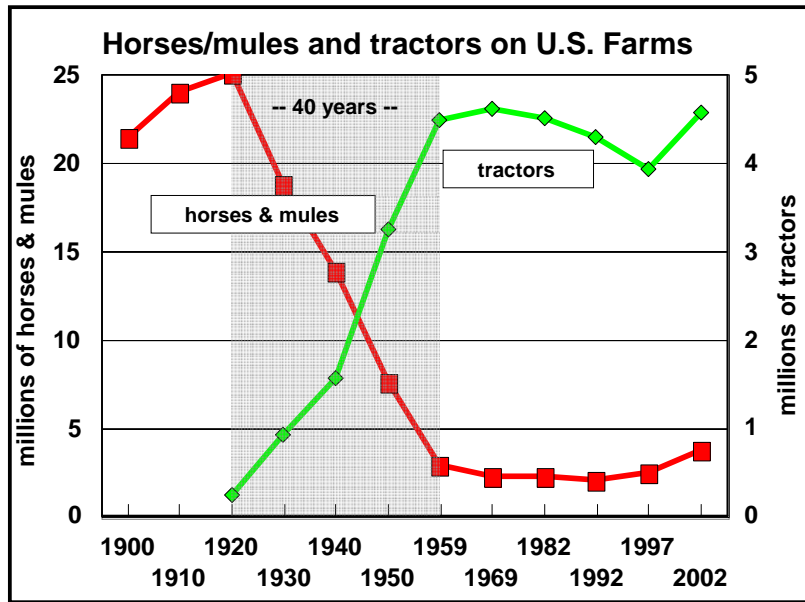
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Other “duh” technologies (most farms)

- **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)

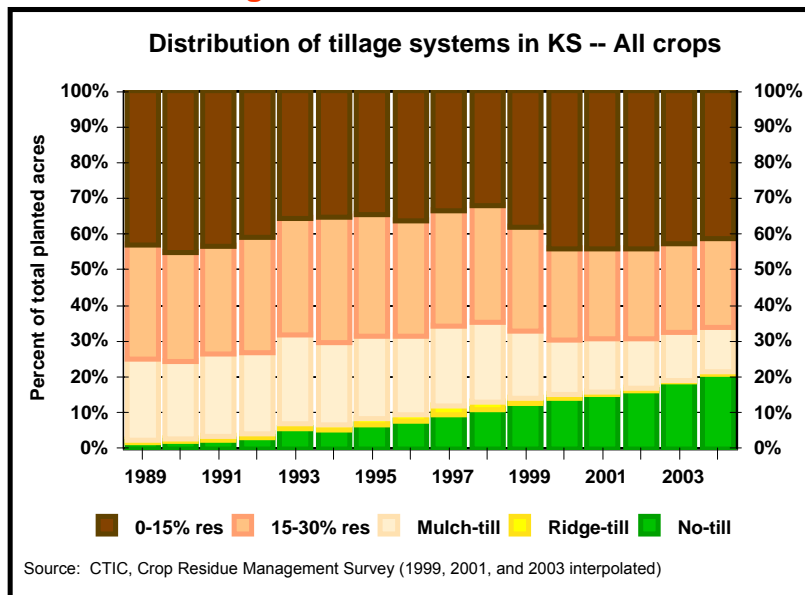
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Some technologies aren't so obvious . . .



Source: U.S. Census of Agriculture

Some technologies aren't so obvious . . .



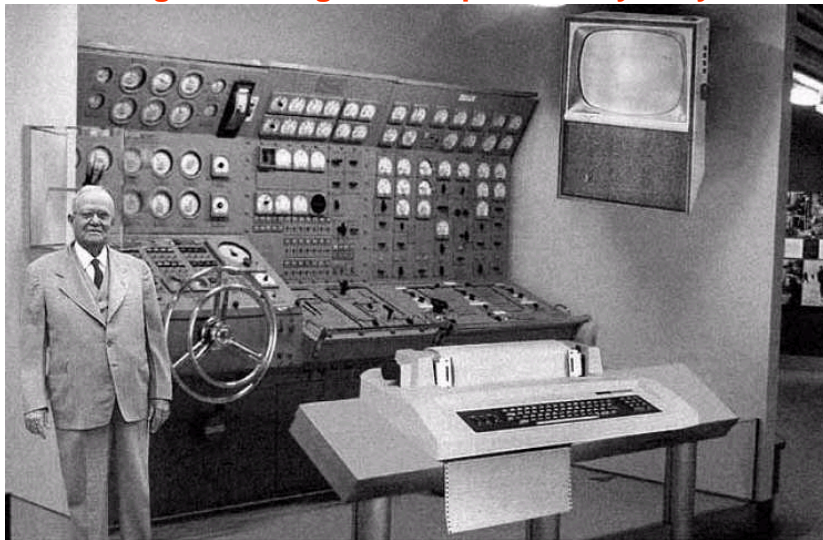
Source: CTIC, Crop Residue Management Survey (1999, 2001, and 2003 interpolated)

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
- Must look beyond the neighbors
 - Not many specialized machines around
 - Consider the web for contacts

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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

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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
- Alabama ag cap rate = 8.03%
- Kansas ag cap rate = 6.64%
- 39-state average cap rate = 6.56%

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Agricultural Market Value of Agricultural Land using Alabama as an example

- Jan. 1, 2005 crop land value = \$2200 /acre
- Cash rent for 2005 = \$40 /acre
- 2005 property tax = \$3.82 /acre
- 2005 after-property-tax rent = \$36.18 /acre
- $\$36.18 / 0.0803 = \451 /acre
- $AMVP = \$451 / \$2200 = 0.205 = 20.5\%$

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

- Jan. 1, 2005 land value = \$760 /acre
- Cash rent for 2005 = \$38.50 /acre
- 2005 property tax = \$4.50 /acre
- 2005 after-property-tax rent = \$34.00 /acre
- $\$34.00 / 0.0664 = \512 /acre

- AMVP (non-irr) = $\$512 / \$760 = 0.674 = 67.4\%$

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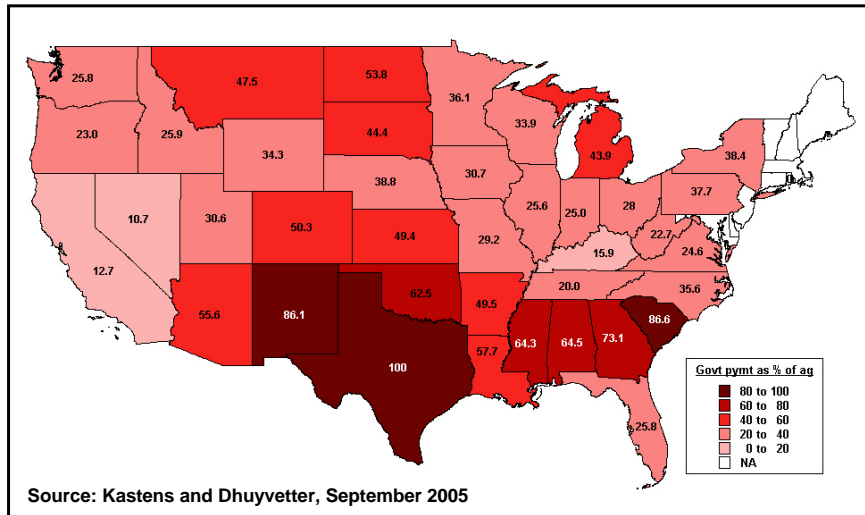
Government Program Payments

- Generally, are thought to be capitalized into land values and cash rents

- Many Great Plains states and many Southern states are highly dependent on government program payments

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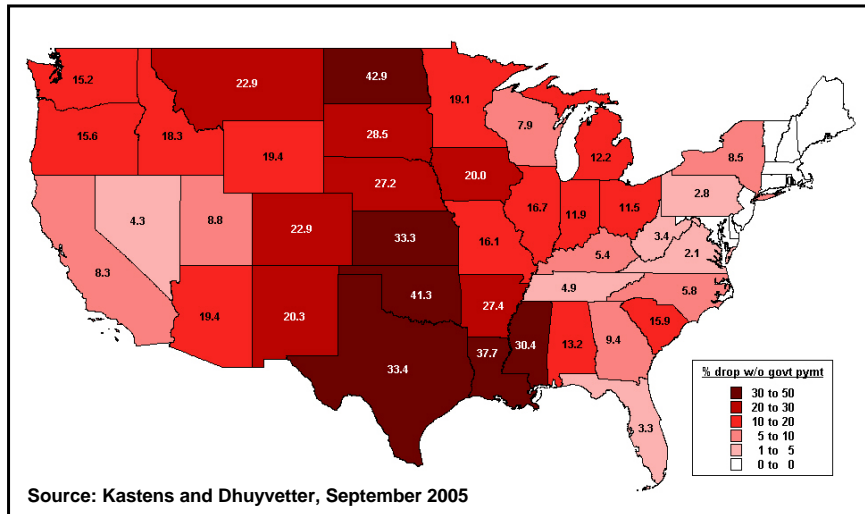
Percentage of Agricultural Value Attributed to Government Program Payments



government payments as a percent of agricultural rent

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Estimated Reduction in Land Value with the Elimination of Government Programs



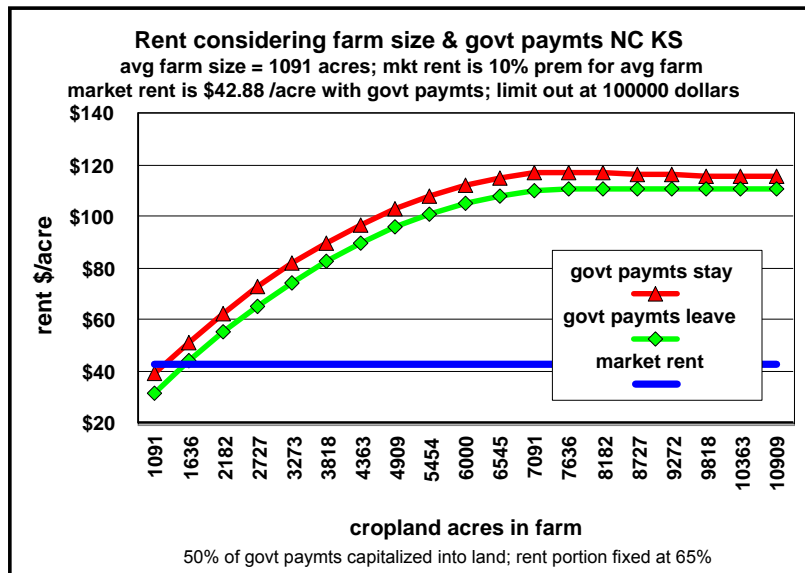
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Would land values really fall that far?

- Tract-specific sales and rent prices indicate that gov't payments are not fully capitalized
- Rental contracts are “sticky”
- Excess profits in big & growing farms
 - Very large KS farms still have ROA of 8% paying existing rent yet taking 36% hit on their land values (Dumler)
 - Easier to exploit economies of size in level playing field regarding gov't payments
 - Increased competition would bolster rents

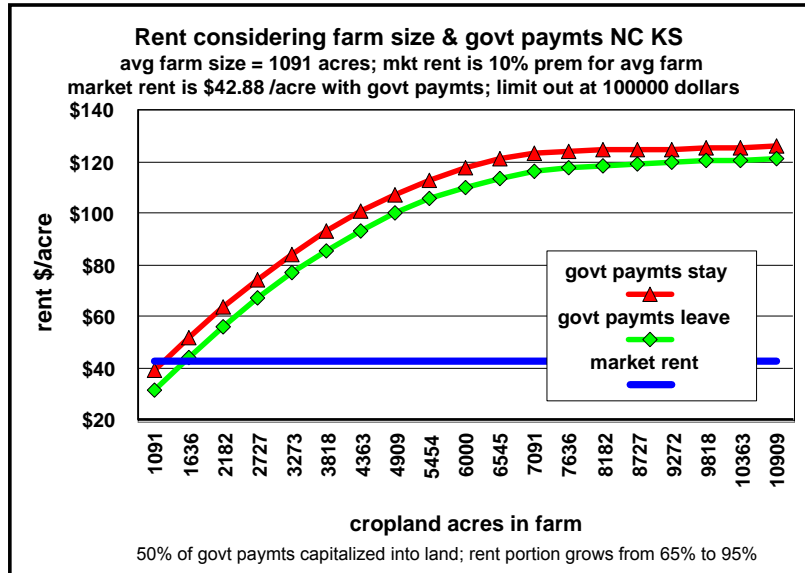
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Farm size vs. government payment: Impact on land rents/values



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Farm size vs. government payment: Impact on land rents/values



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4. More paperwork (computer work?)

A. improved accrual accounting

B. better capital asset management

– land and machinery

C. improved production data mgmt & analysis

– precision ag / on-farm research

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

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Day-to-day decisions improved

- **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
 - Talking to neighbors won't cut it
- **Need to be able to objectively and numerically analyze decisions**
 - “Management by numbers”

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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**

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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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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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Questions ???



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