

## Land Values – Trends and Analysis

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**[www.agmanager.info](http://www.agmanager.info)**

### **Purpose of land talks**

- **Develop an understanding of the underlying economic principles and management aspects of land ownership and leasing**
- **Trying to reduce decisions to numbers**
- **Two decision tools:**
  - *KSU-Landbuy.xls*
  - *KSU-Lease.xls*

**Related papers are found at**  
**[www.agmanager.info](http://www.agmanager.info)**

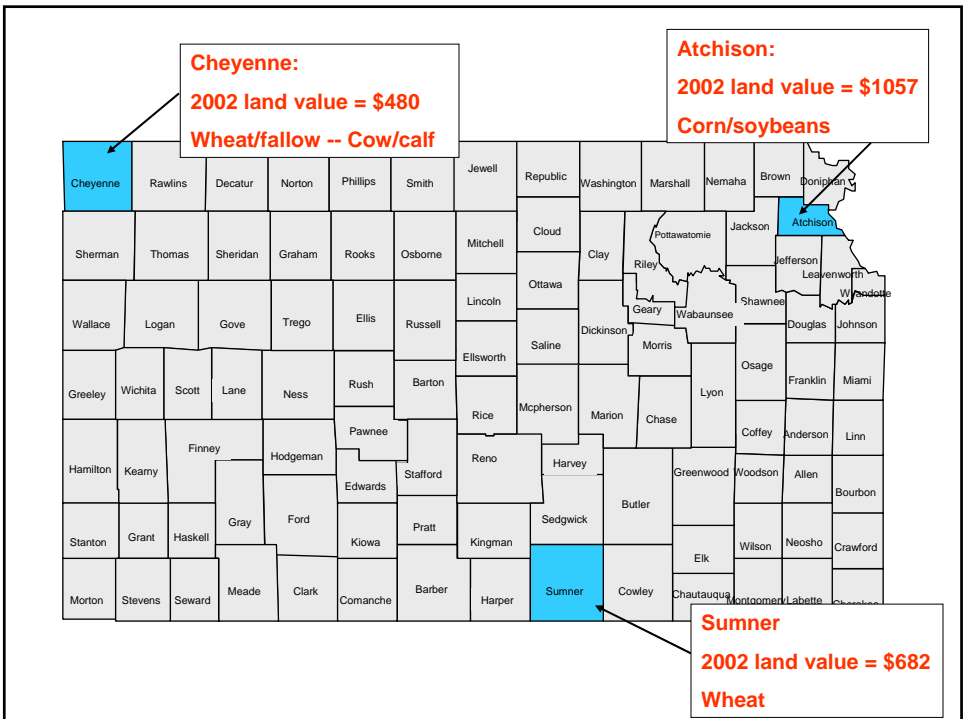
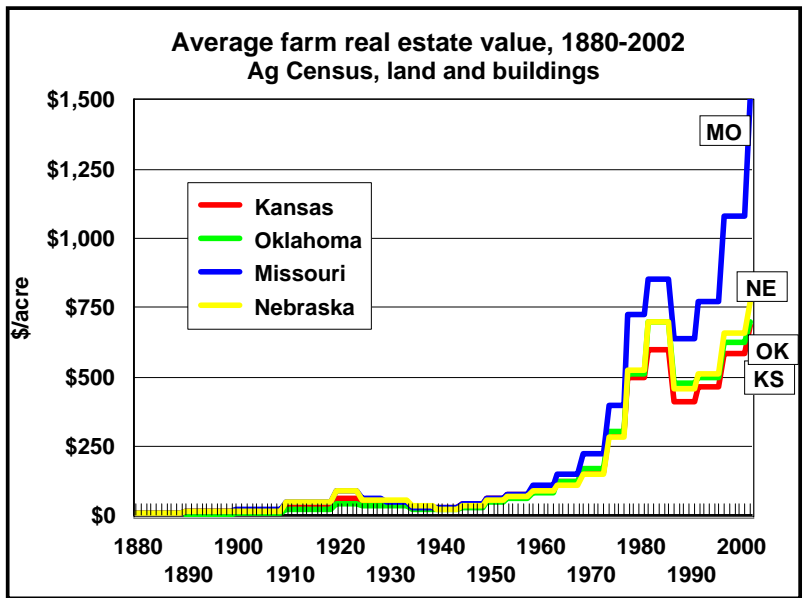
## Historical land values and growth

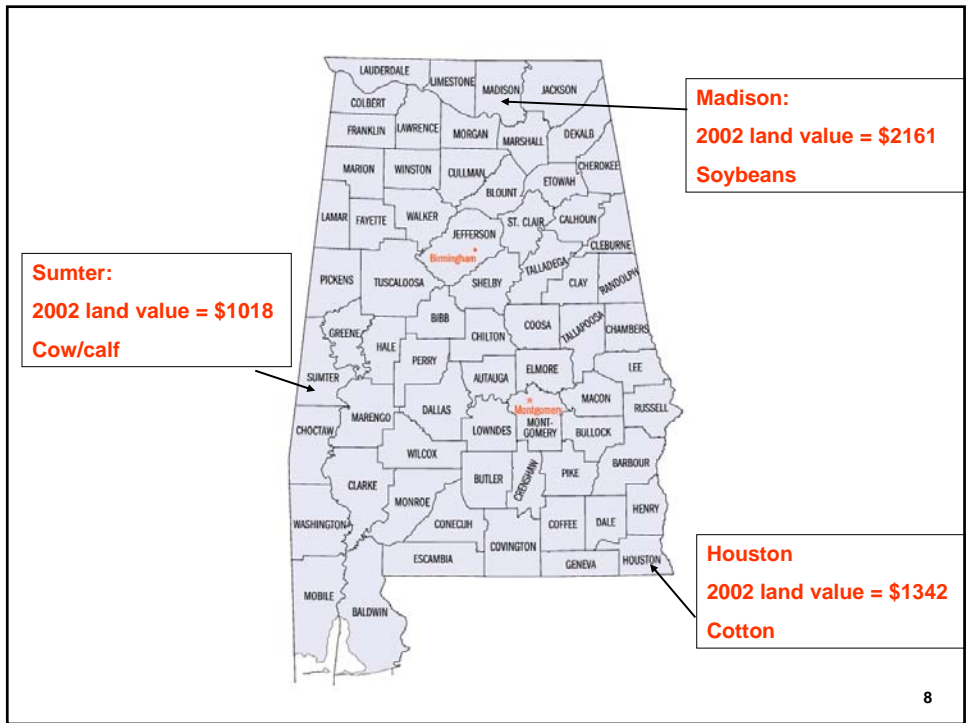
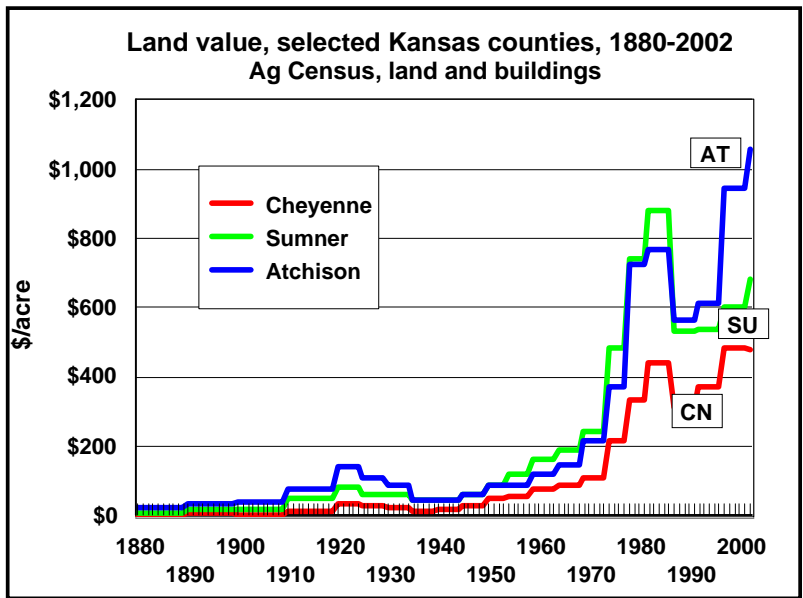
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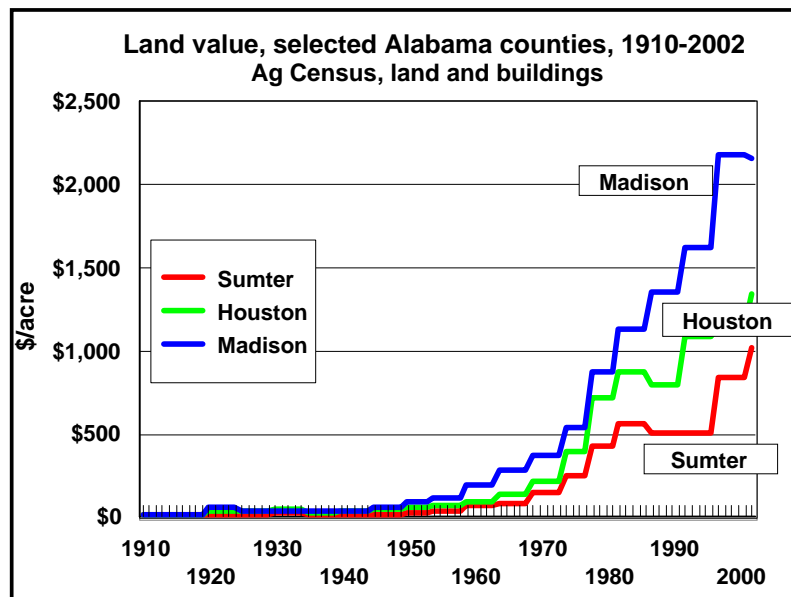
## Land is Unique

- **Most fixed of farming assets**
  - Residual claimant
  - Capitalizes government subsidies
- **Often is taxed**
  - Favorably or unfavorably
- **Has non-ag benefits that may be pecuniary**
- **Has non-pecuniary benefits**
- **A long term investment involving long term expectations – history is a guide**

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1910: Sumter = \$13; Houston = \$17; Madison = \$21 (Madison never fell in 80's)

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## Annual Growth Rate

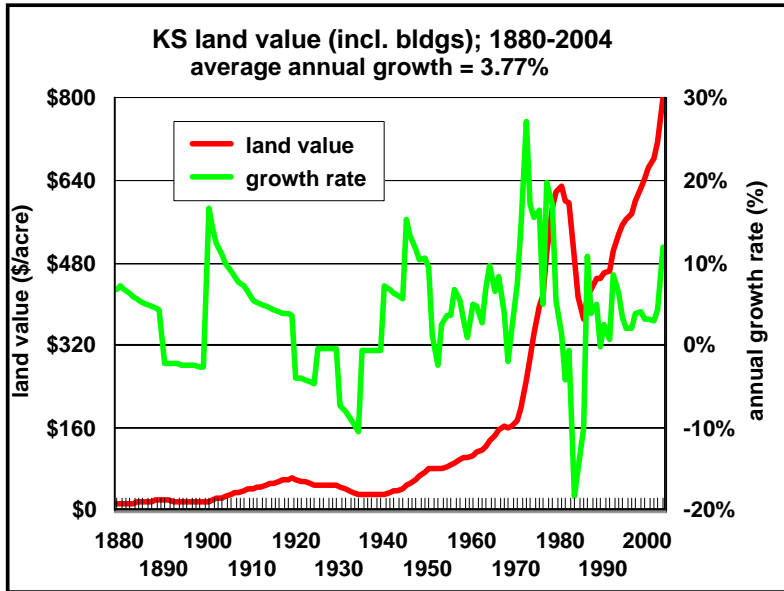
$$V_m = V_{m-1} * (1 + g_m)$$

$$\begin{aligned} V_{2005} &= V_{2004} * (1 + g_{2005}) \\ &= \$800 * (1.03) = \$824.00 \end{aligned}$$

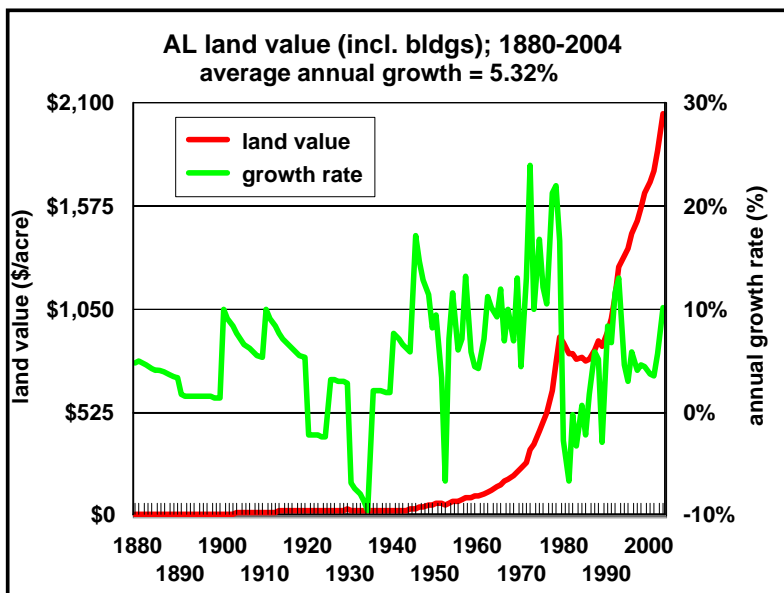
$$g_m = \frac{V_m}{V_{m-1}} - 1$$

$$\begin{aligned} g_{2005} &= \frac{V_{2005}}{V_{2004}} - 1 \\ &= \frac{\$824.00}{\$800.00} - 1 = 0.03 = 3\% \end{aligned}$$

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## Historical Growth

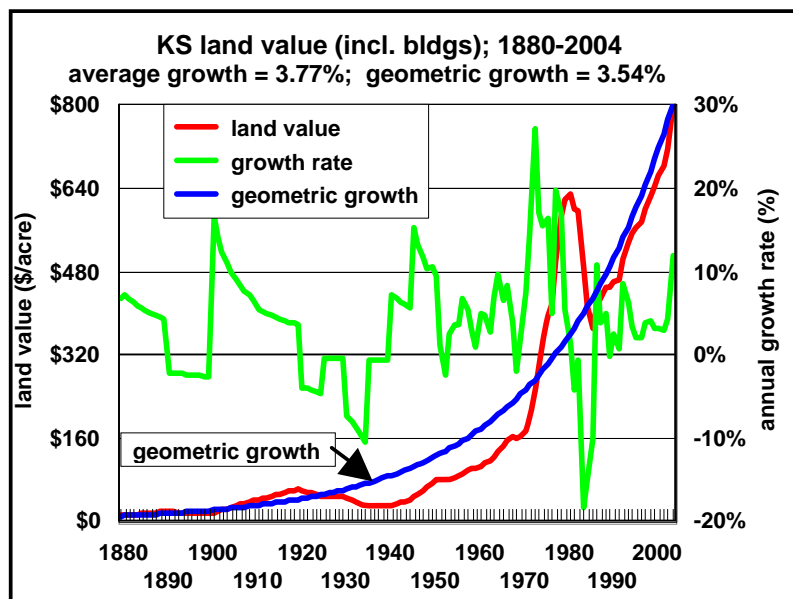
$$\text{average growth} = \frac{1}{125} * (g_{1880} + g_{1881} + \dots + g_{2004})$$

$$V_n = V_m * (1 + g)^{n-m}$$

$$\text{geometric mean} = g = \left( \frac{V_n}{V_m} \right)^{\left( \frac{1}{n-m} \right)} - 1$$

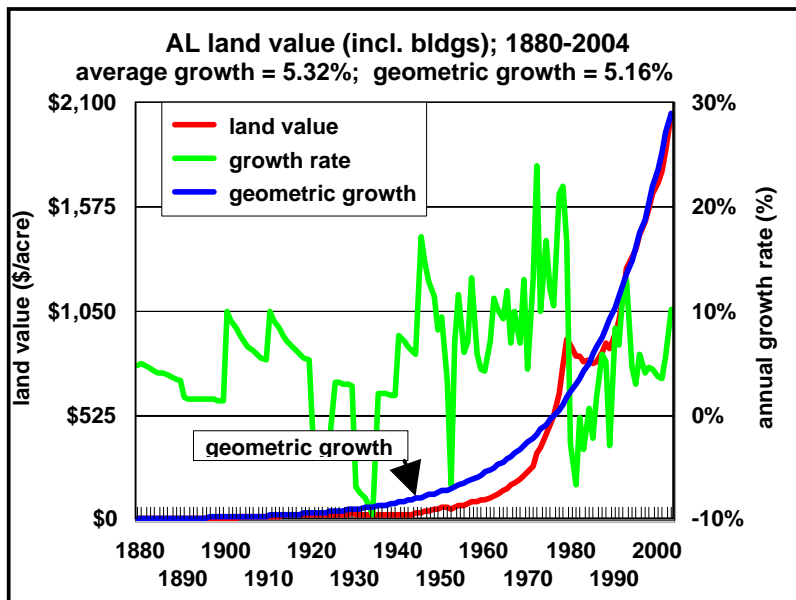
$$g = \left( \frac{V_{2004}}{V_{1879}} \right)^{\left( \frac{1}{2004-1879} \right)} - 1 = \left( \frac{800}{\$10.30} \right)^{\frac{1}{125}} - 1 = 0.0354$$

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1879 starting land value for Kansas was \$10.30

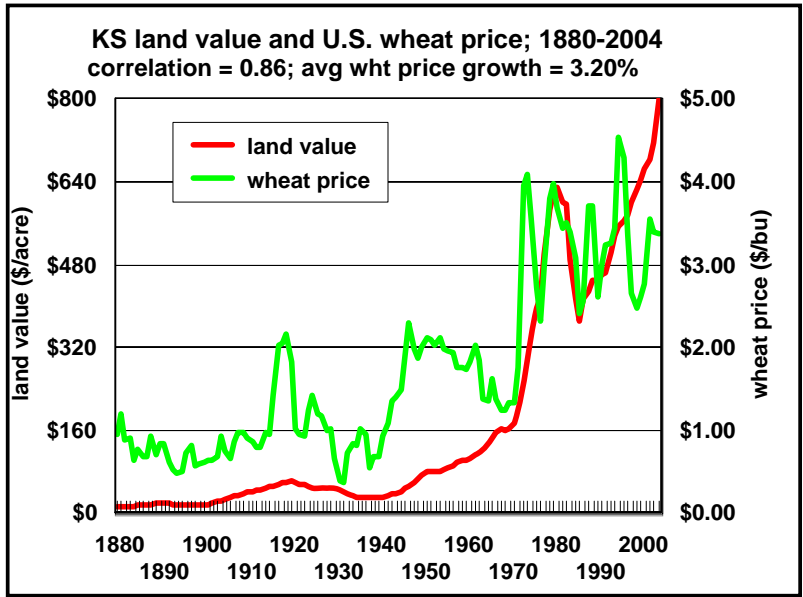
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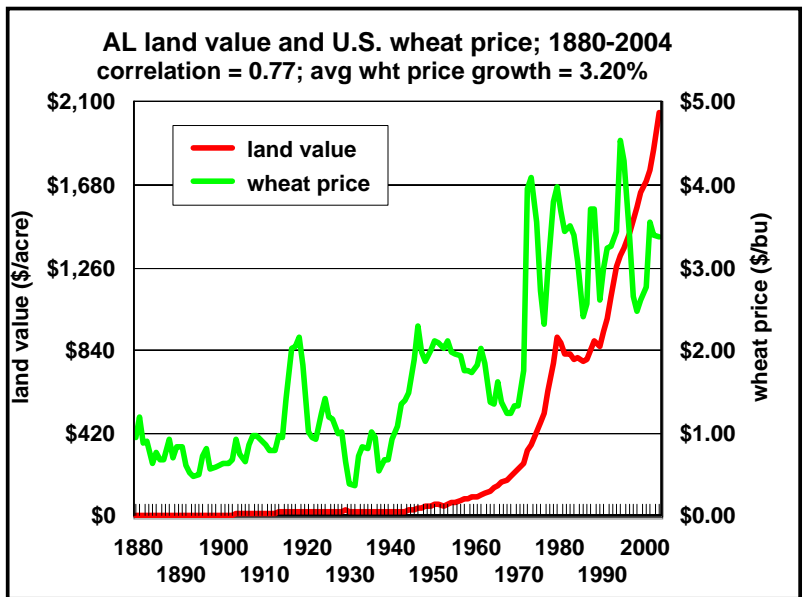
1879 starting land value for Alabama was \$3.82

**What drives land prices in the long run?**

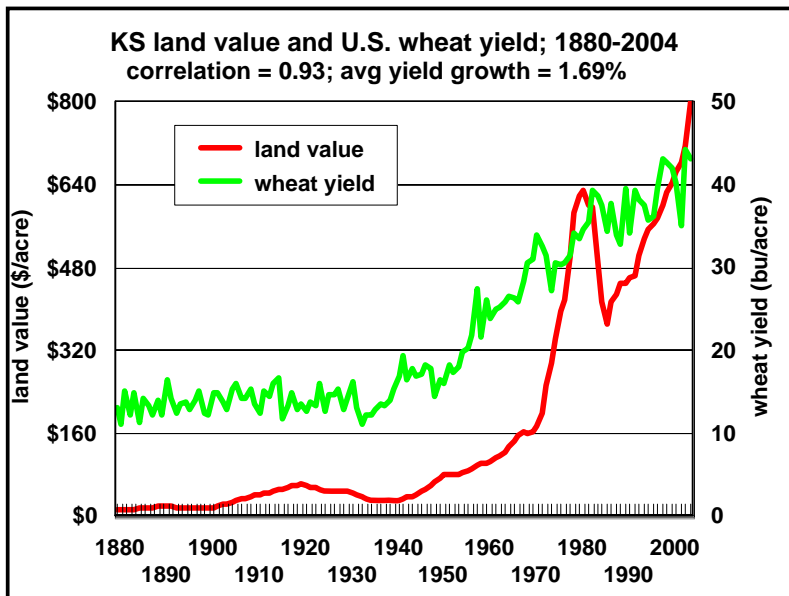




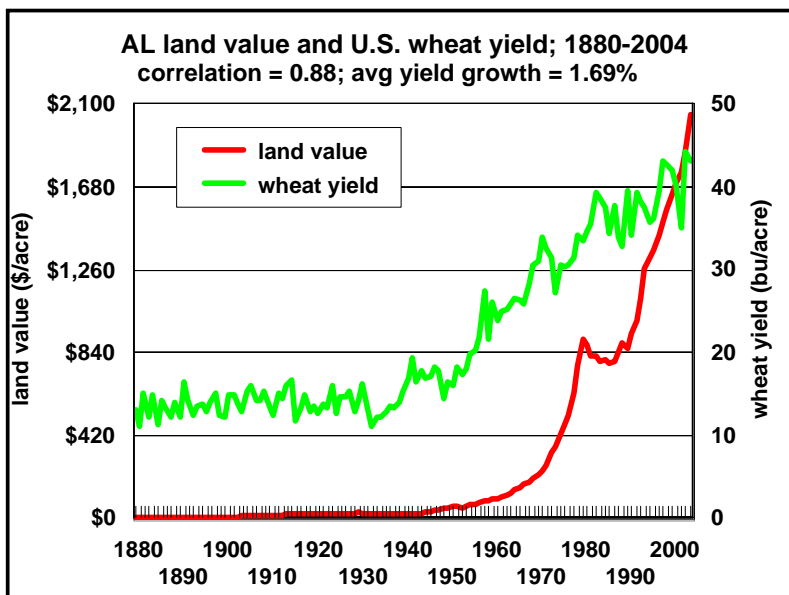
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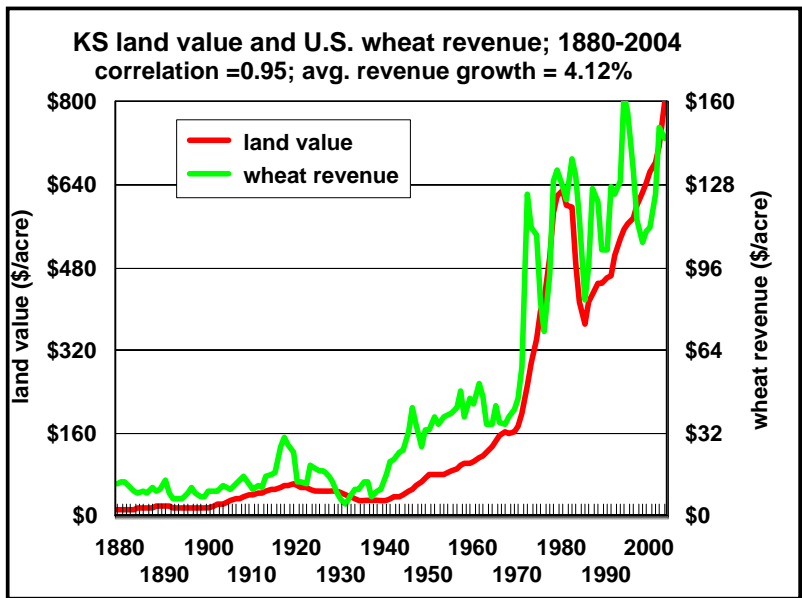
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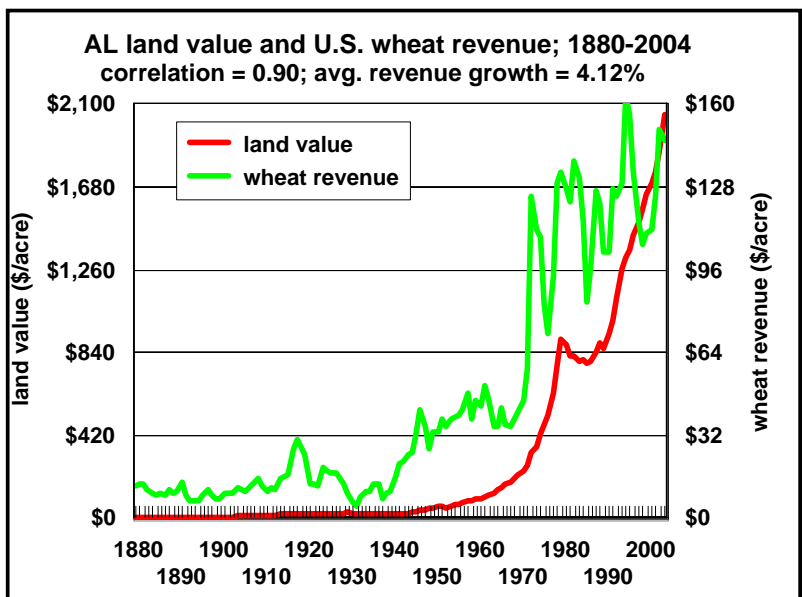
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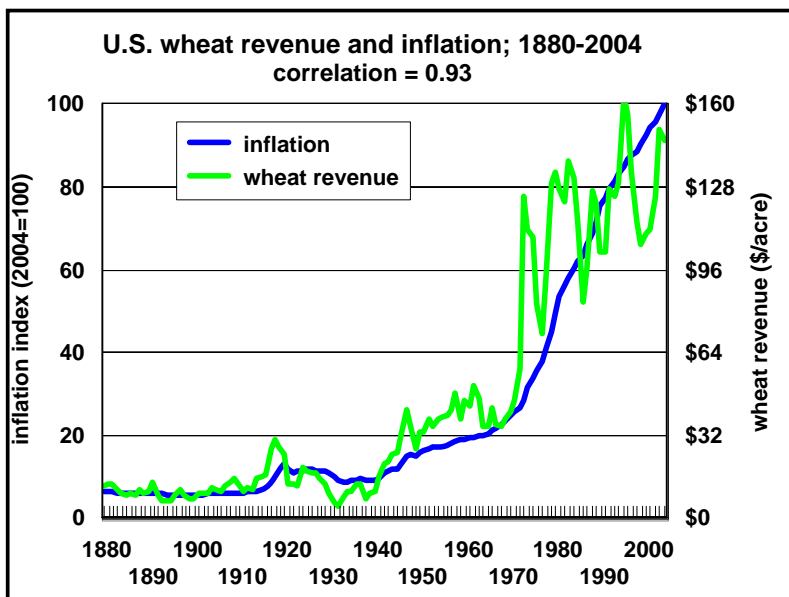


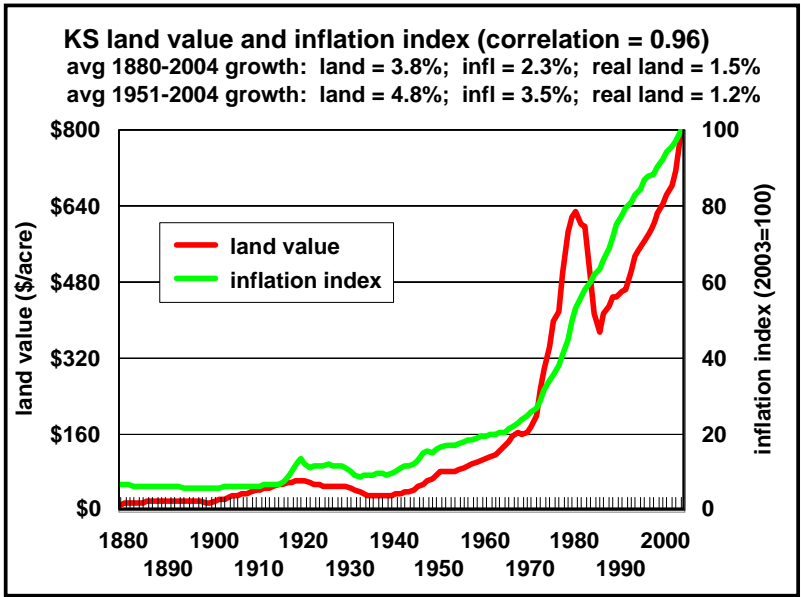
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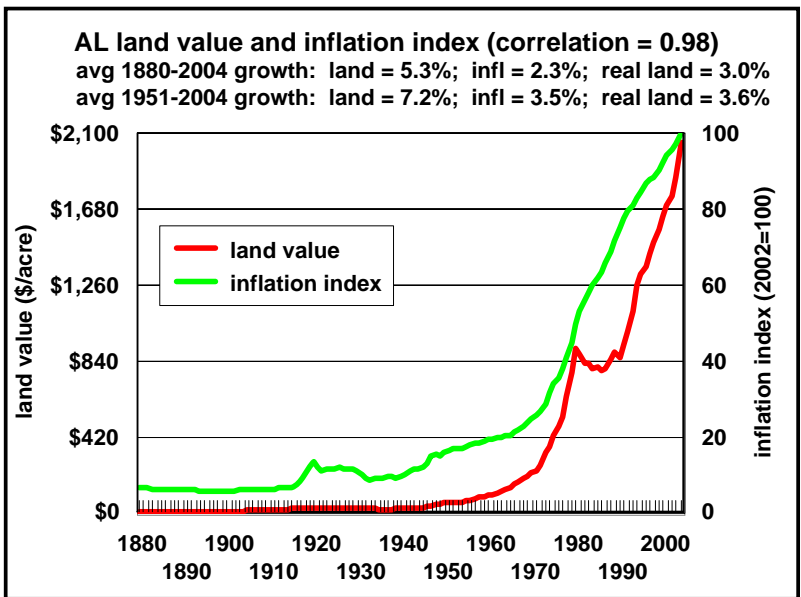
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But, what drives crop revenue?

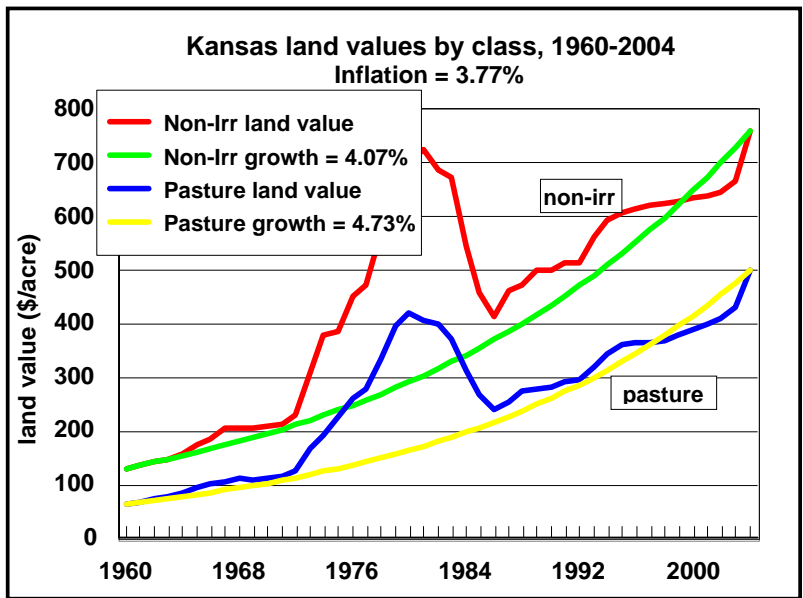




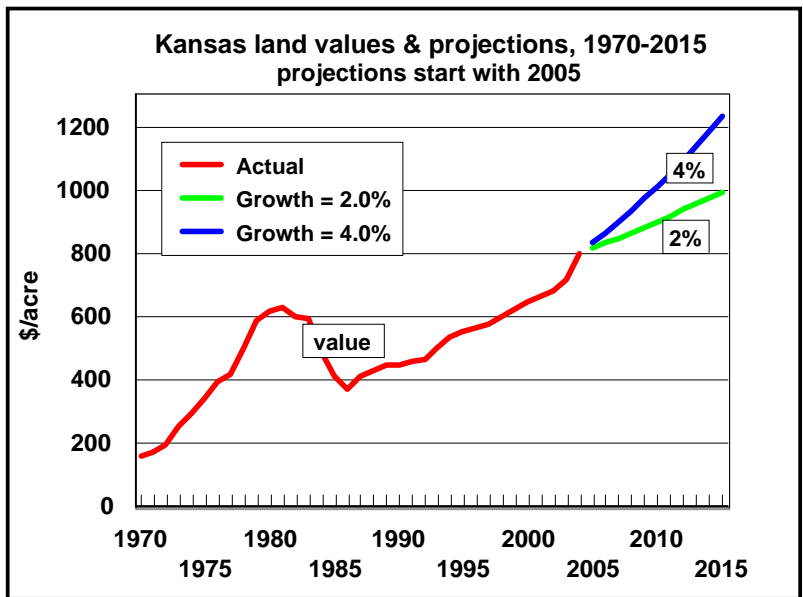
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## Returns to land



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## Returns to land

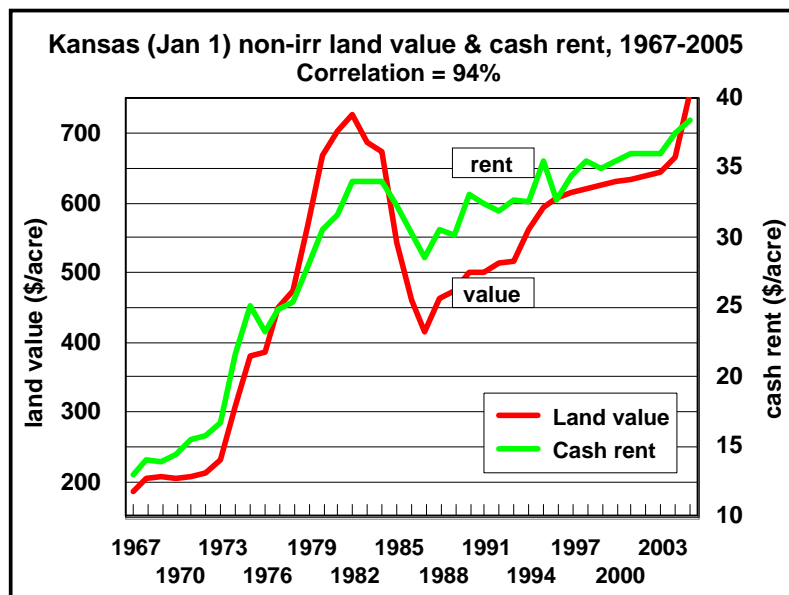
- Capital gains (growth)
- Cash returns (rent)
  
- The two returns to land are similar to other investments such as the stock market (capital gains and dividends)

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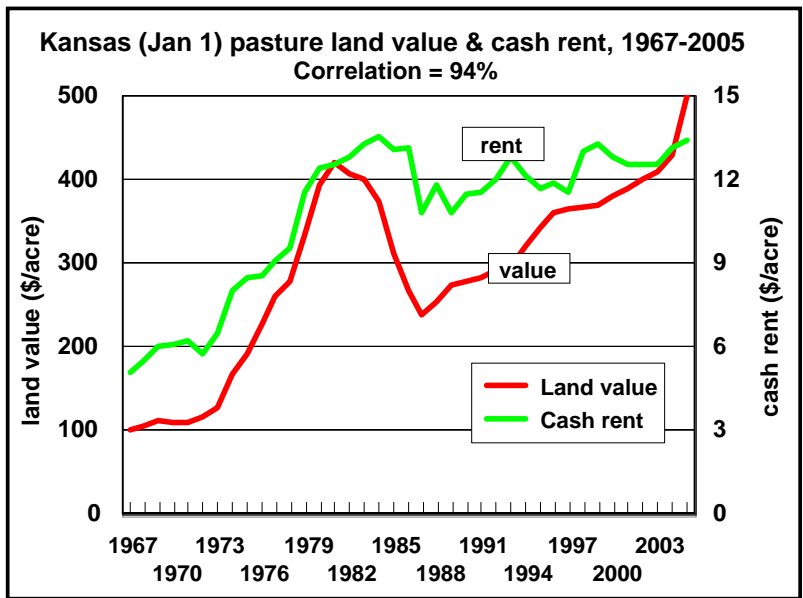
## Rent

- **KFMA farms with > 100 crop acres (2001-2003 avg)**
  - 89% of KFMA farms use rented crop land  
(range across six regions, 85%-94%)
  - 63% of crop acres farmed by KFMA members are rented  
(range across six regions, 58%-72%)
- **For owner-operators rent is the “profit” assigned to land after all other opportunity costs are considered**

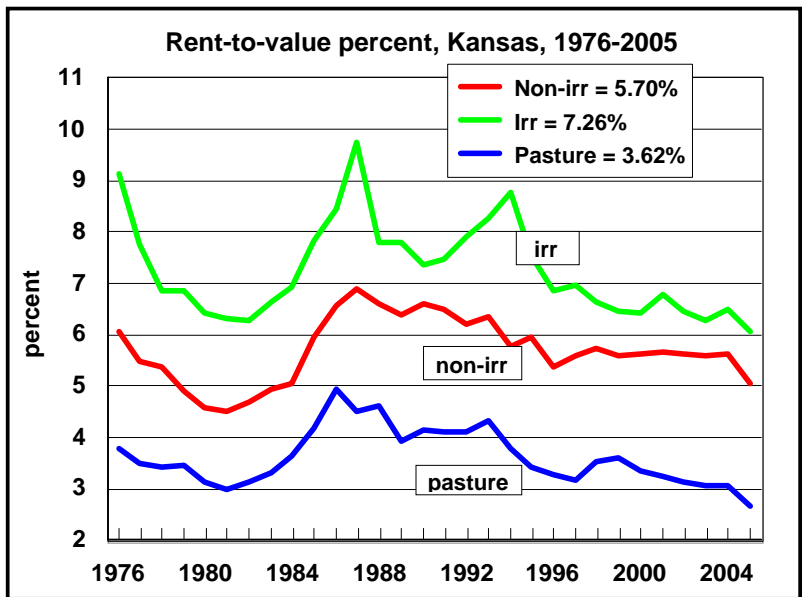
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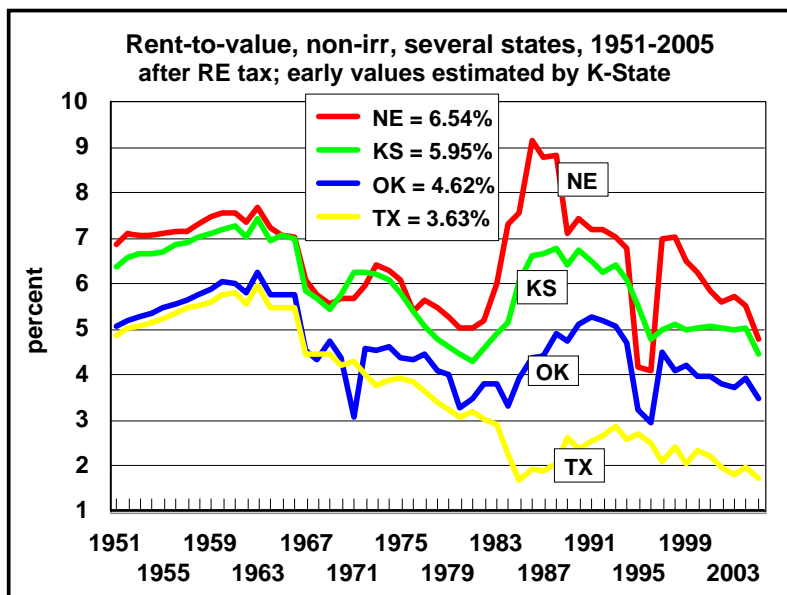


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## Why are Rents Lower on Pasture than on Farmland?

- People just love cows and pasture
- Security more important in cattle production
- Imperfect markets/sticky prices
  - share rents would adjust to technology faster
  - share rents would keep cash rents in line
  - little share renting in pasture
  - landlord management small (tenant power)
- Less desirable pastures are rented
  - size, shape, location, grass quality, water, fences

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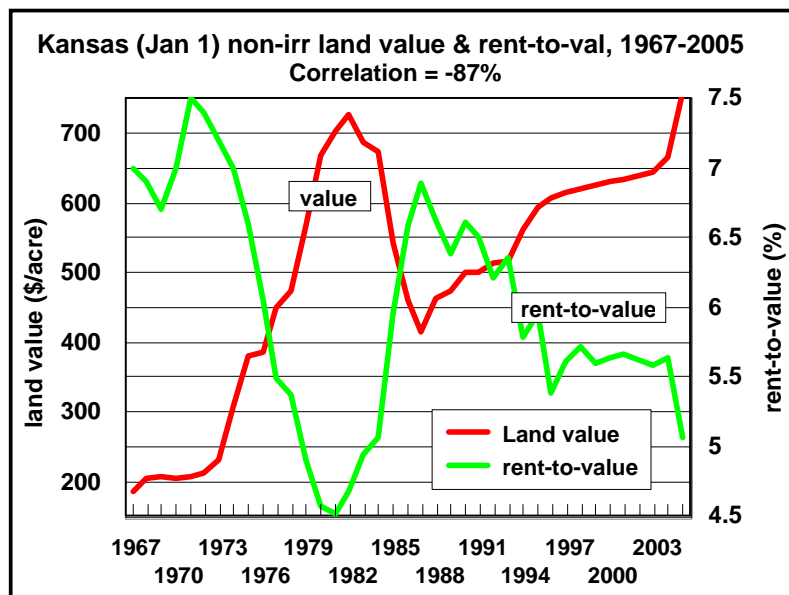
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## Capitalization Formula

$$\text{Value} = \frac{\text{Annual land income}}{\text{Capitalization rate}}$$

$$\text{Cap rate (rtv)} = \frac{\text{Annual land income}}{\text{Value}}$$

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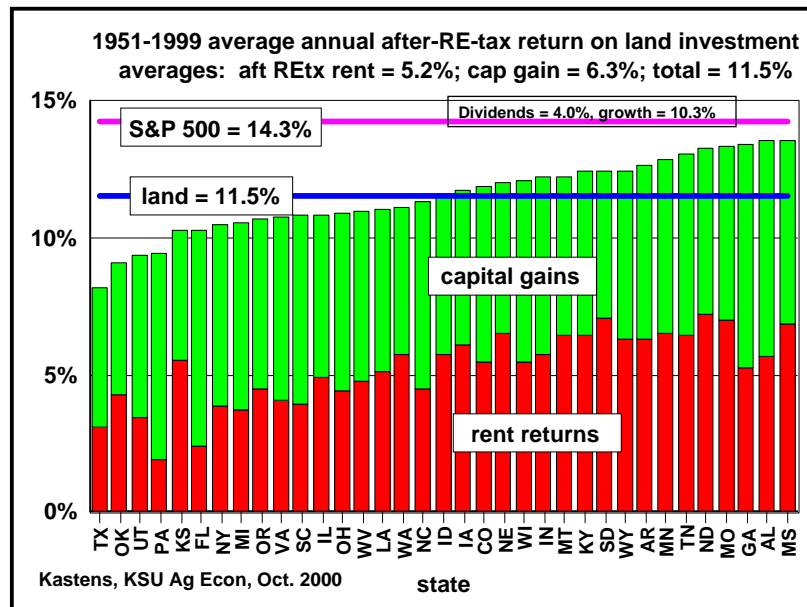


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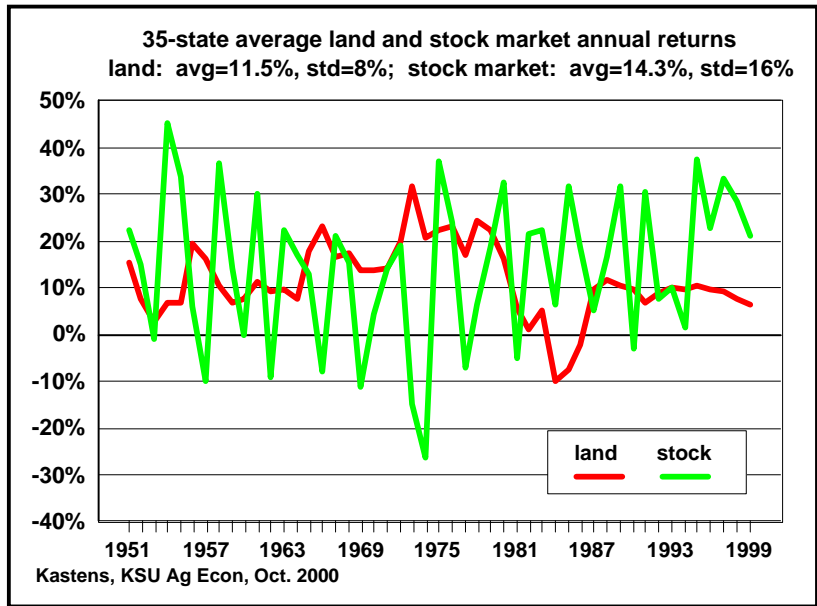
## Returns to Land

- Land
  - Cash returns: rents or rent-equivalents on owned land
  - Non-cash returns: capital gains (growth)
- Stock market
  - Cash returns: dividends
  - Non-cash returns: capital gains (growth)
- Typically, neither land nor stock investments “cash flow”

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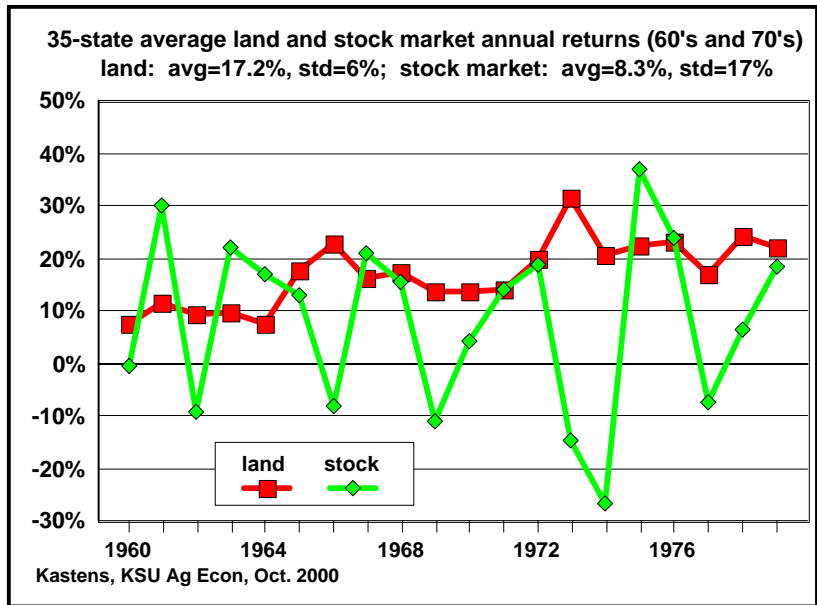


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stock has twice the risk of land

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during long periods of time stock and land returns can diverge

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## Combining Land & Stock Investments

- Profitability
  - Stock returns > land returns in long periods
- Risk
  - By itself stock is riskier than land
  - Less risky in a portfolio setting
    - Stock and land returns are negatively correlated (-0.25)
    - Does NOT depend on negative correlation
- Land/stock portfolio
  - Profits (returns) are a linear blend of land-alone and stock-alone investments
  - Risk falls then rises with increased stock
  - Investor chooses desired risk/reward combination

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## Two ways to add stock to farm investments

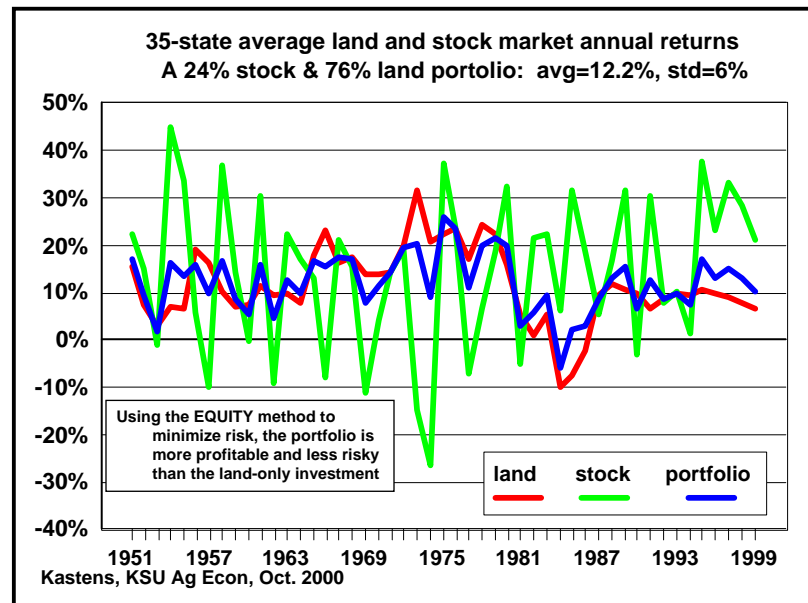
- Debt
  - Farm borrows money to buy stock and pays interest on borrowed money. For every \$1 of farm equity, farm borrows \$H and pays interest at the rate of I, so that portfolio returns are:
    - $P_d = F + H(S - I)$
- Equity
  - Farm uses farm equity (sells assets) to purchase stock. Where K is the portion of a farm's equity that is converted to stock investment ( $0 \leq K \leq 1$ ):
    - $P_e = (1 - K)F + KS$

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## Buying stock with debt or equity

- **Debt**
  - Negative correlation is often needed for portfolio risk to be lower than risk for farm-only or stock-only investments
  - Can a farm borrow the money required?
  - Tradeoff between debt-induced risk and portfolio risk reduction
  - Is stock investment the best use of excess borrowing capacity?
- **Equity**
  - Should a farm downsize to buy stock?
  - Can a farm sell farm assets and rent them back, to free up equity for stock purchase without downsizing?

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## Land returns vs. farm returns

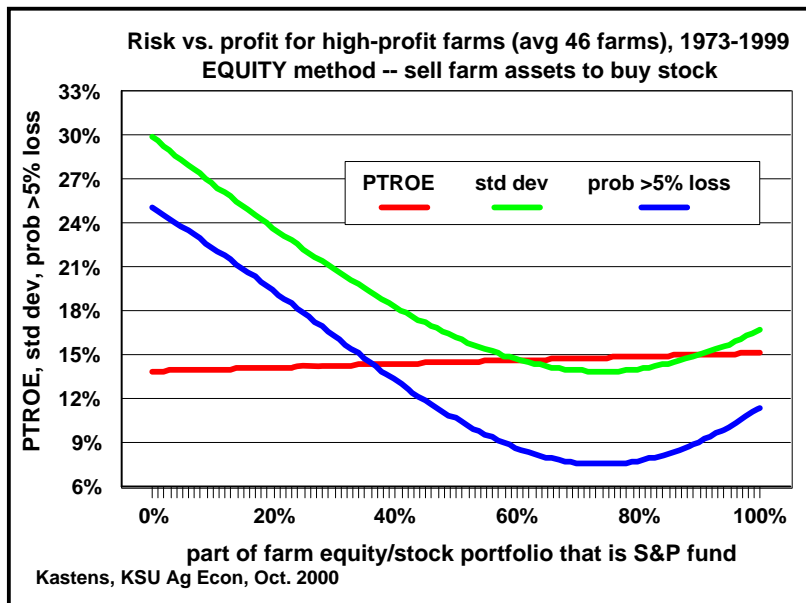
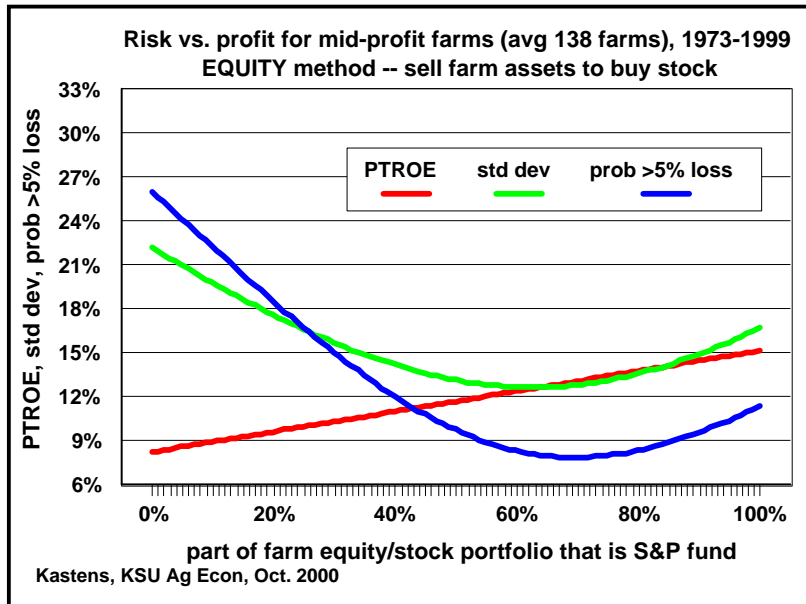
- **Kansas Farm Management Associations**
  - 2,000+ farms per year 1973 – 1999
    - Less farms if require multi-year presence
  - Calculated an after-tax ROE, ATROE
  - Converted ATROE to pre-tax according to:  
 $PTROE = ATROE / (1 - 0.35)$
- **Kansas farm returns are compared to Kansas land returns and to the S&P**

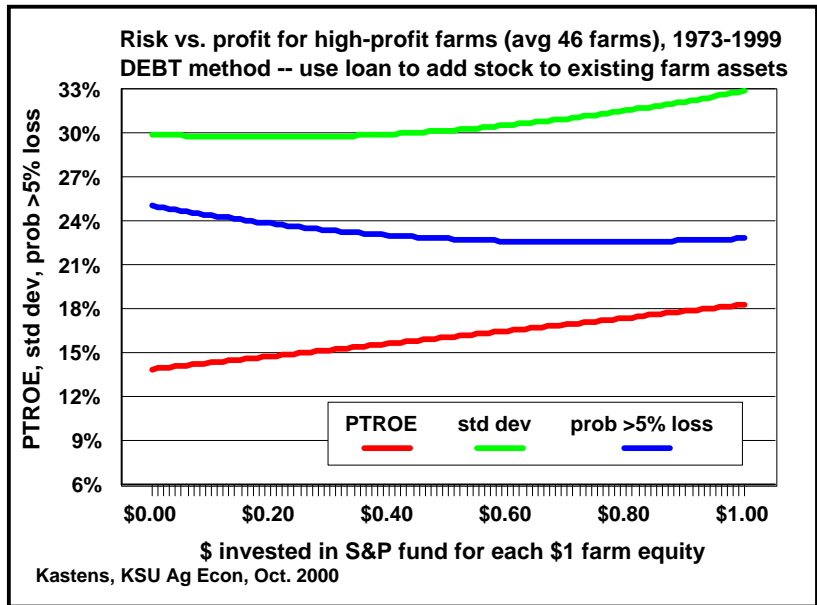
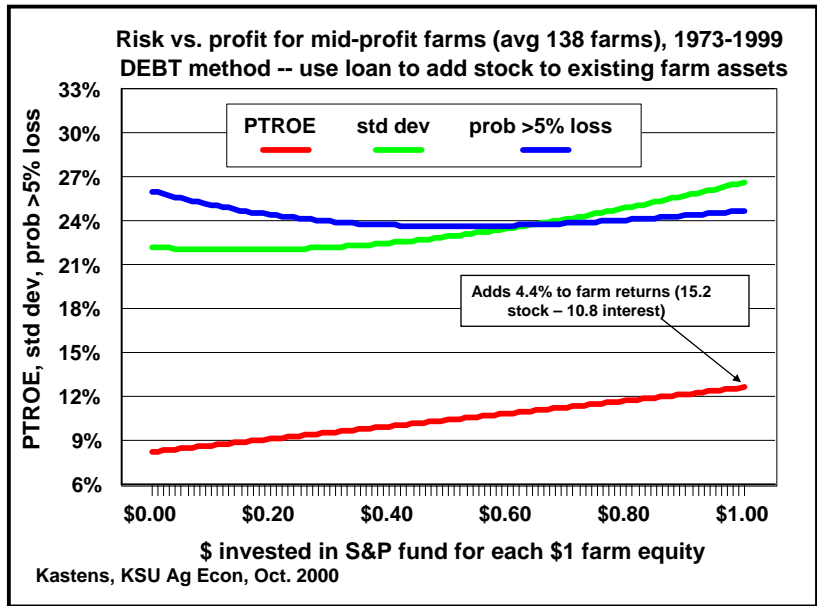
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## 1973-1999 annual returns

- **S&P fund**  
15.2% avg and 16.7% std
- **Land portfolio**  
10.1% avg and 10.7% std
- **Portfolio of average farms (138 farms)**  
8.3% avg and 10.5% std
- **Portfolio of “top-third” farms (46 farms)**  
13.9% avg and 14.8% std
- **Portfolios of farms, or land, or stock have lower risk than individual farms, parcels, or stocks**

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## Using debt to purchase stock

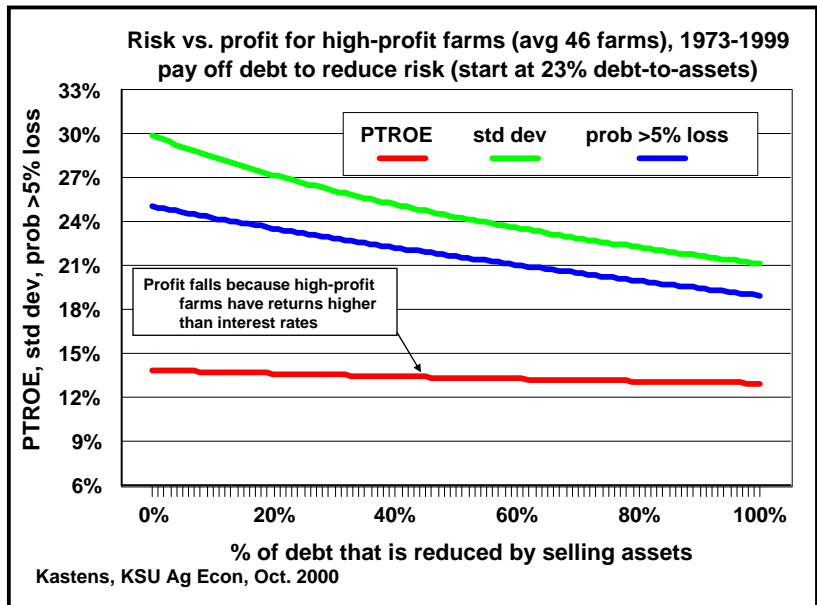
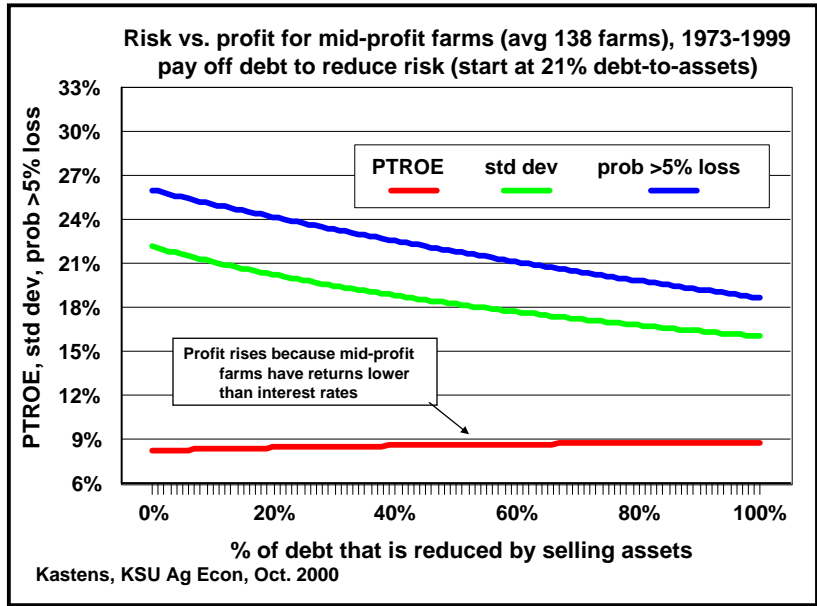
- **Considerations:**
  - 1. **Stock purchase doesn't reduce risk much**
  - 2. **Are stock returns higher than farm returns?**
  - 3. **Are stock returns higher than interest rates?**
  - 4. **Does farm have excess borrowing capacity?**
    - **Leverage ratio increases with increased stock purchase**
  - 5. **Is this the best thing to do with excess borrowing capacity?**
    - **Costs might fall with a farm expansion?**
  - 6. **Servicing debt wouldn't be hard (sell shares)**

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## Using equity to purchase stock

- **Considerations:**
  - 1. **Are stock returns higher than farm returns?**
  - 2. **Will downsizing the farm hurt profitability?**
  - 3. **Can you do this without downsizing?**
    - **Sell capital assets and rent back**
    - **Bring in off-farm or outside equity capital**
  - 4. **Stock purchase reduces risk substantially**
  - 5. **Is this the best way to reduce risk?**
    - **If goal is to reduce risk could pay down debt instead**

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## Revisiting risk & profit & stock purchase

- **Risk and stock ownership:**
  - To reduce risk, leveraged farms might just as well sell assets and reduce debt as buy stock
- **Profitability & stock ownership & farm size**
  - Work at K-State suggests profits are \$0.15 to \$0.22/acre higher for each 1% a farm is larger than its regional cohorts (after accounting for other management factors)

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## Who is most likely to buy stock?

- **Low- to mid-profit farms with little to no debt**
  - Use equity to buy stock:
    - If had debt probably would pay on it first because risk & profit similar across debt reduction & stock
  - Use debt to buy stock:
    - No-debt farms could take on added risk of debt
  - Often, the above farms are hobby/lifestyle farms
  - Retired farmers (landlords)
    - Can't capture the EOS of farming
    - Want more liquid assets in retirement

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## Final comments

- **Stock investment is a long run decision**
  - Will my historical analysis bear out?
- **Will an individual stock purchase capture any “excessive” profits involved?**
  - Am I too late; is the risk acceptable?
- **Think carefully about economies of size**
  - Am I a good manager?
- **Is stock purchase part of a short-run or long-run goal to exit farming**
- **Often comes down to**
  - Will the market allow me to be a full-time farmer?
  - Do I want to be a full-time farmer?

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## Background for *KSU-Landbuy*

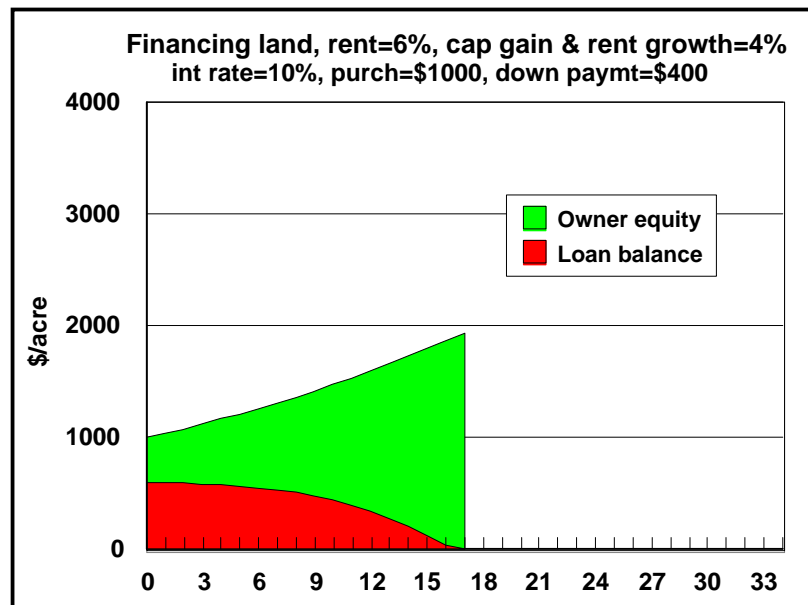


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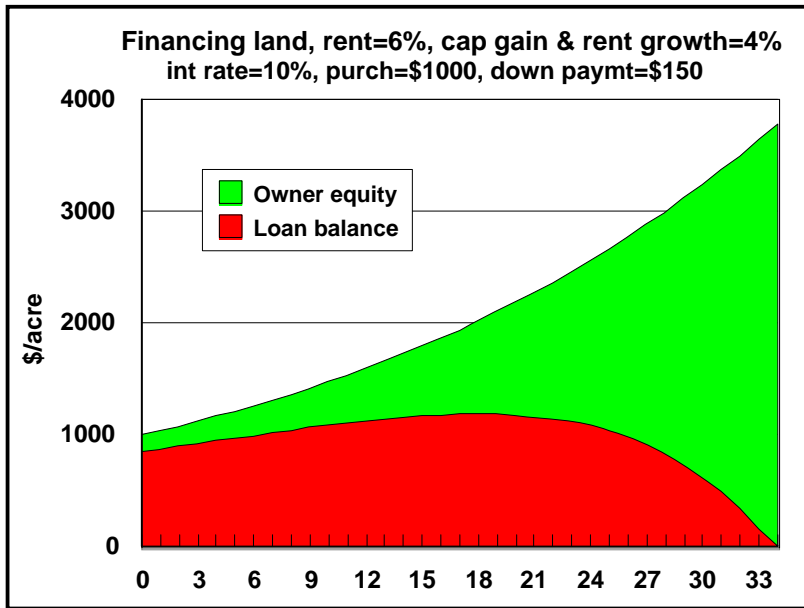
## Buying and owning land – ideas

- Total return = rent + capital gain
- Land doesn't cash flow when purchased
  - i.e, rents don't cover a 100% loan
- Cash flow is not the same as profitability
- Rents grow, loan payments don't
  - land eventually cash flows
- Income tax and capital gains tax rates matter

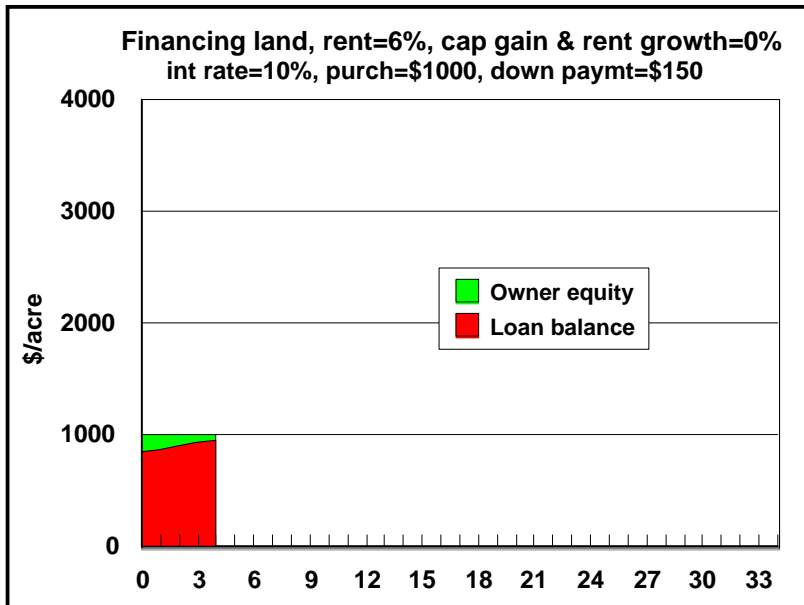
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## Time Value of Money

- \$1 received today can earn interest:

$$V_n = V_0 * (1 + i)^n$$

$$V_3 = V_0 * (1 + i)^3 = \$1 * 1.08 * 1.08 * 1.08 = \$1.26$$

- \$1 received in the future is worth less today:

$$V_0 = \frac{V_n}{(1 + i)^n}$$

$$V_0 = \frac{V_3}{(1 + i)^3} = \frac{\$1}{1.08^3} = \$0.79$$

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- Today's value of a stream of future rents:

$$PVR = \frac{R_1}{(1 + i)^1} + \frac{R_2}{(1 + i)^2} + \dots + \frac{R_T}{(1 + i)^T}$$

- Future rents based on growing today's rent:

$$PVR = \frac{R_0 * (1 + g)^1}{(1 + i)^1} + \frac{R_0 * (1 + g)^2}{(1 + i)^2} + \dots + \frac{R_0 * (1 + g)^T}{(1 + i)^T}$$

- Rents need adjusted for property tax and income tax; interest rate needs adjusted for income tax:

$$PVR = \frac{(R_0 - Ptx_0) * (1 - Itx) * (1 + g)^1}{[1 + i * (1 - Itx)]^1} + \frac{(R_0 - Ptx_0) * (1 - Itx) * (1 + g)^2}{[1 + i * (1 - Itx)]^2} + \dots + \frac{(R_0 - Ptx_0) * (1 - Itx) * (1 + g)^T}{[1 + i * (1 - Itx)]^T}$$

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- Today's value of net future land sale:

$$PVS = \frac{SP - Ctx * (SP - PP)}{[1 + i * (1 - Itx)]^T}$$

- Future land value based on growing today's value:

$$PVS = \frac{MV_0 * (1 + g)^T - Ctx * [MV_0 * (1 + g)^T - PP]}{[1 + i * (1 - Itx)]^T}$$

- Total value of the land is today's value of the rent stream plus today's value of the future land sale:

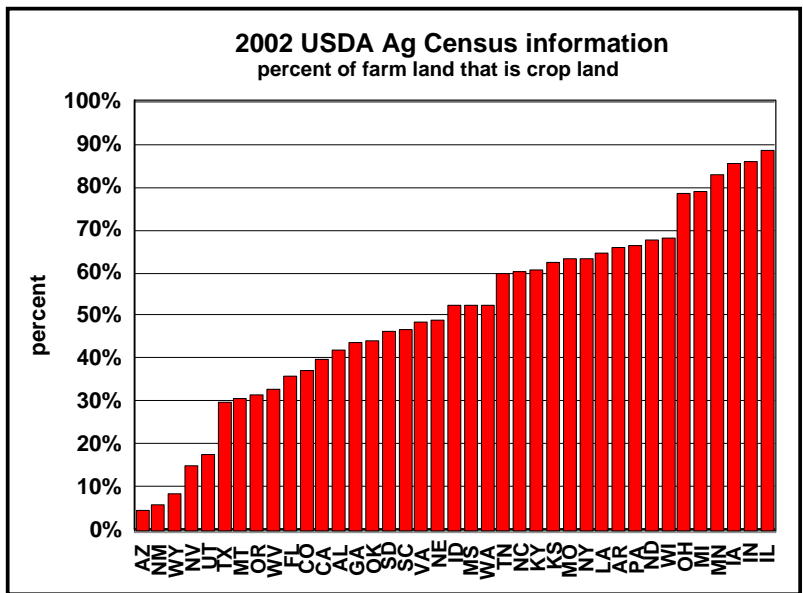
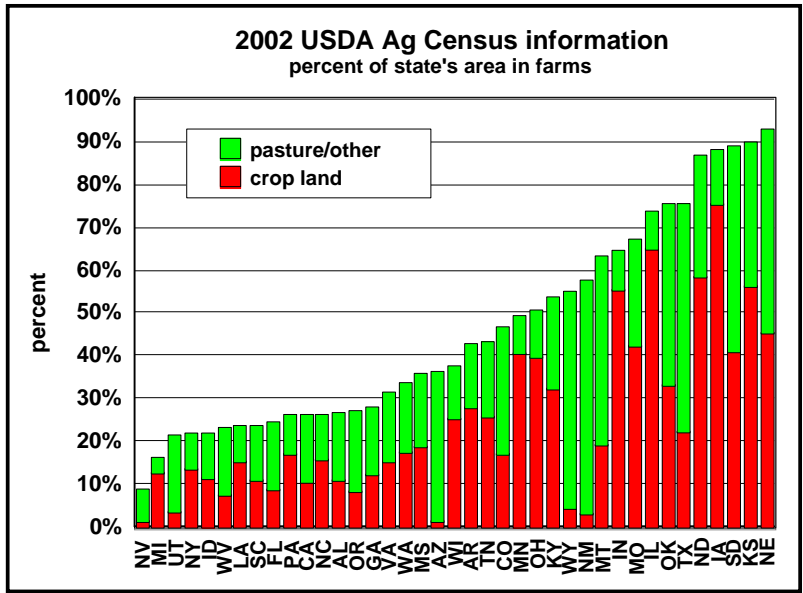
$$PVL = PVR + PVS$$

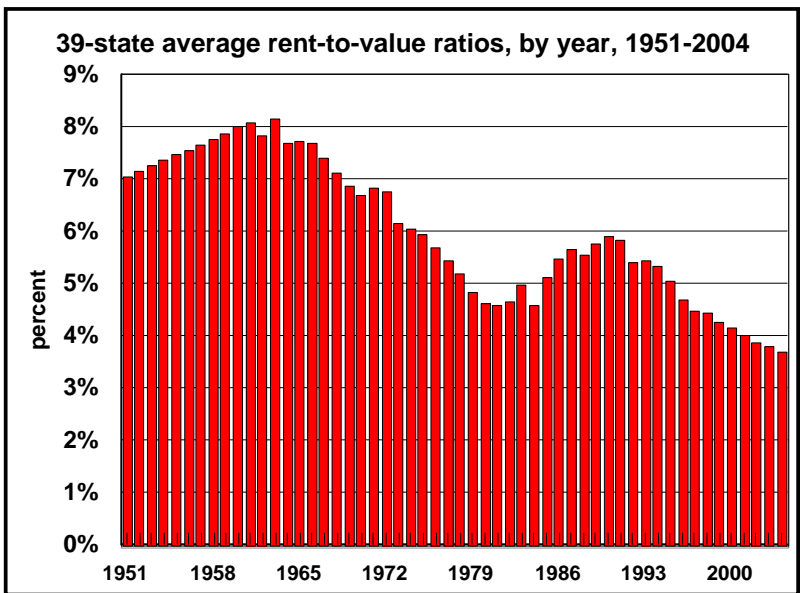
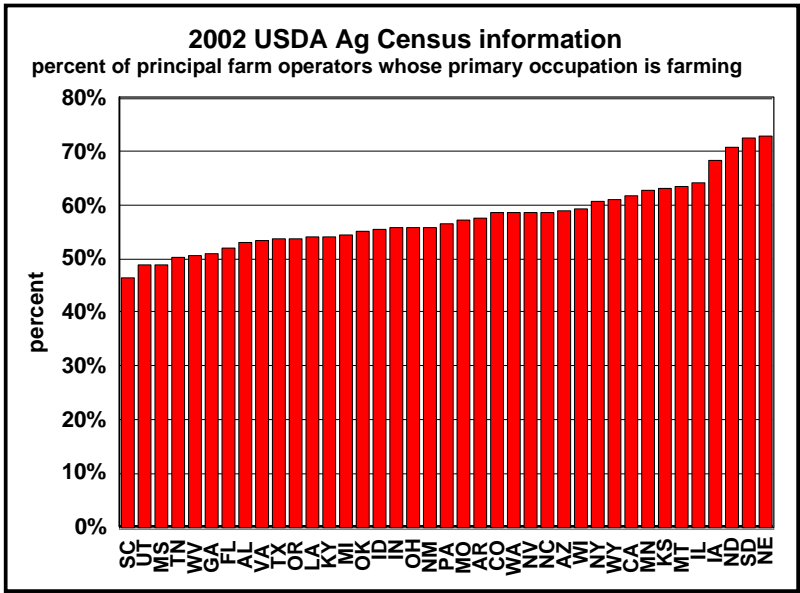
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## Non-ag Considerations

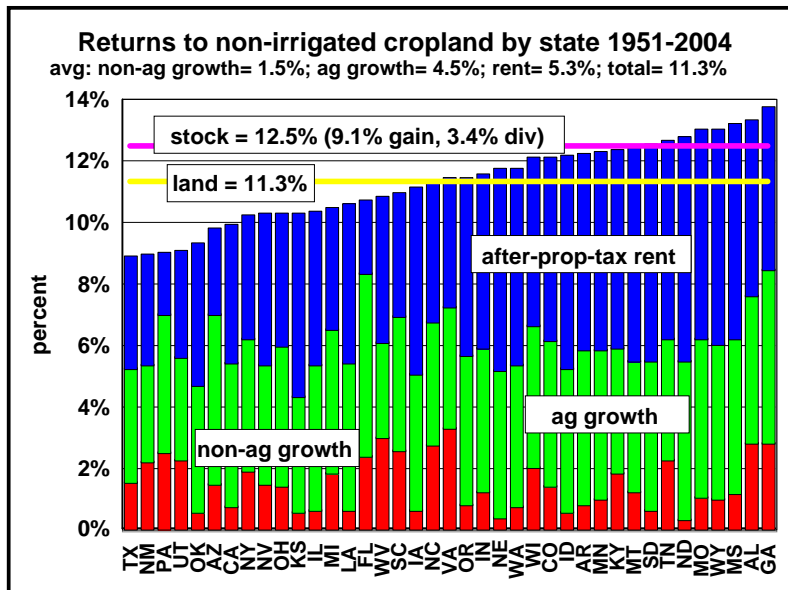
- There could be a non-ag rent:
  - e.g., leasing your land to hunters
- There could be a non-ag land value growth:
  - e.g., expectations of future development
- *KSU-Landbuy.xls* allows for both
- But first some historical information

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39 states ranked by total returns to land

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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**

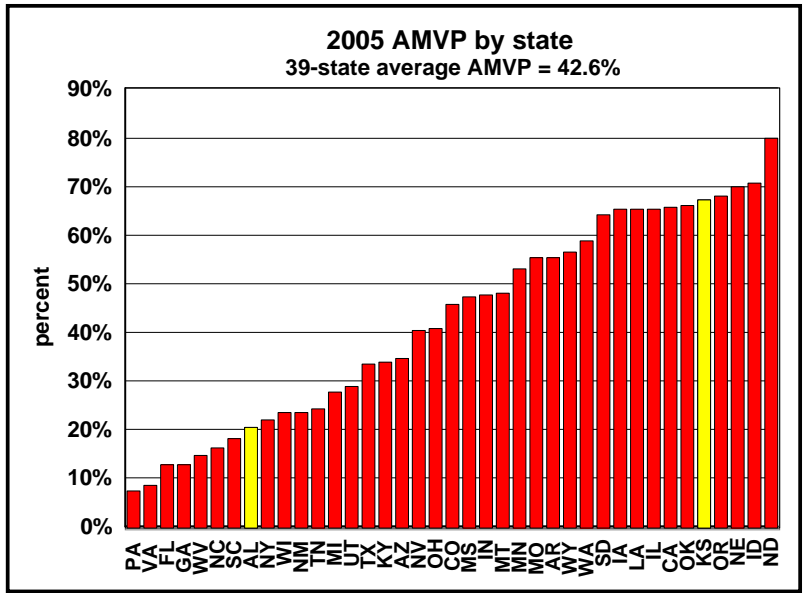
- Jan. 1, 2005 crop land value = \$2200 /acre
- Cash rent for 2005 = \$40 /acre
- 2005 property tax = \$3.82 /acre
- 2005 after-property-tax rent = \$36.18 /acre
- $\$36.18 / 0.0803 = \$451$  /acre
  
- $AMVP = \$451 / \$2200 = 0.205 = 20.5\%$

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

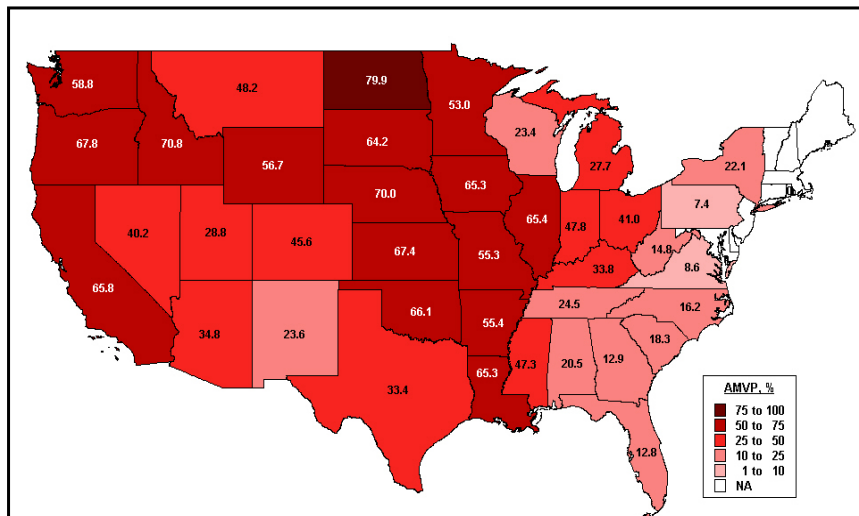
- Jan. 1, 2005 land value = \$760 /acre
- Cash rent for 2005 = \$38.50 /acre
- 2005 property tax = \$4.50 /acre
- 2005 after-property-tax rent = \$34.00 /acre
- $\$34.00 / 0.0664 = \$512$  /acre
  
- $AMVP (non-irr) = \$512 / \$760 = 0.674 = 67.4\%$

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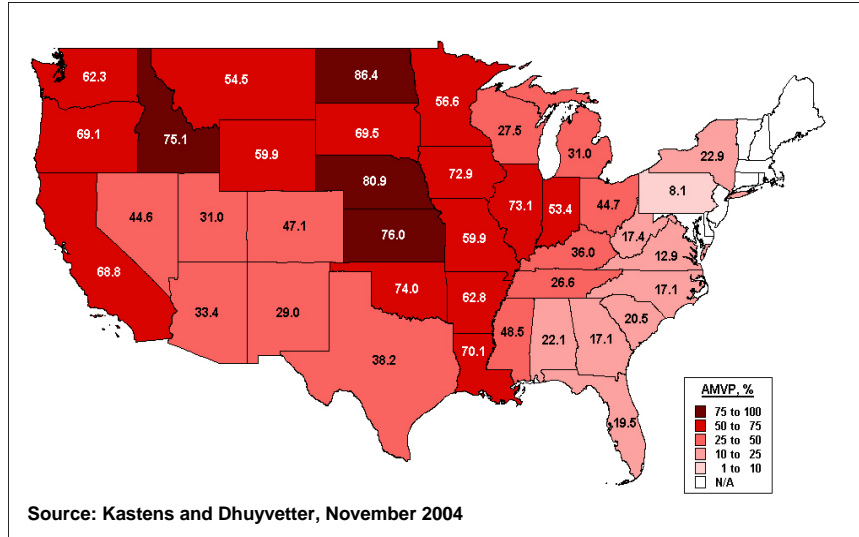


percent of land value that is due to agriculture

### Portion of Land Value Attributed to Agricultural (production and government payments)



## Portion of Land Value Attributed to Agricultural (production and government payments)



last year's map for comparison

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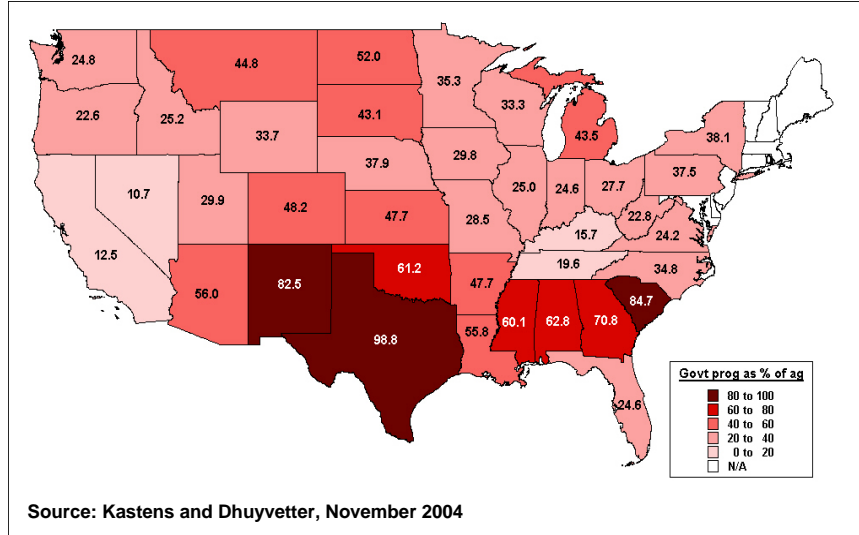
## Government Program Payments

- 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



last year's map for comparison

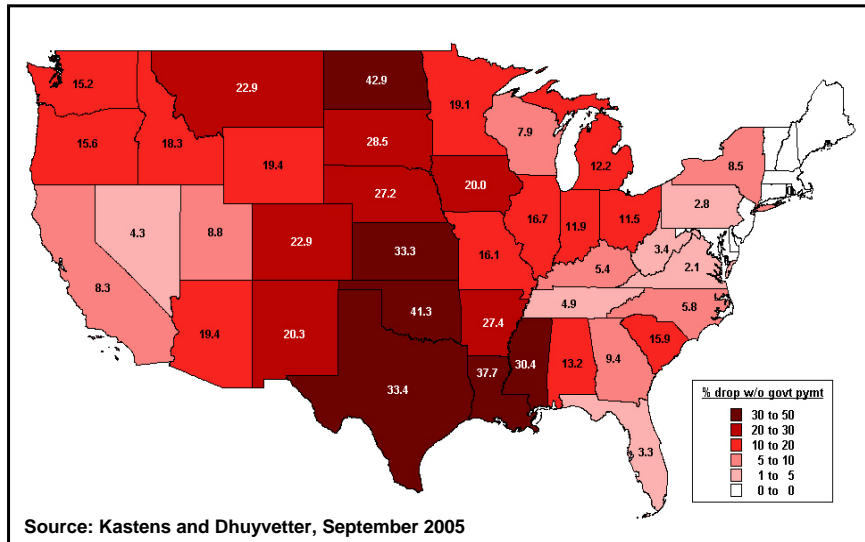
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## Government Program Payments

- States whose land values have substantial non-ag components would not suffer as much in the absence of payments
  - Alabama and Georgia are notable Southern states
  - Great Plains states don't have that advantage

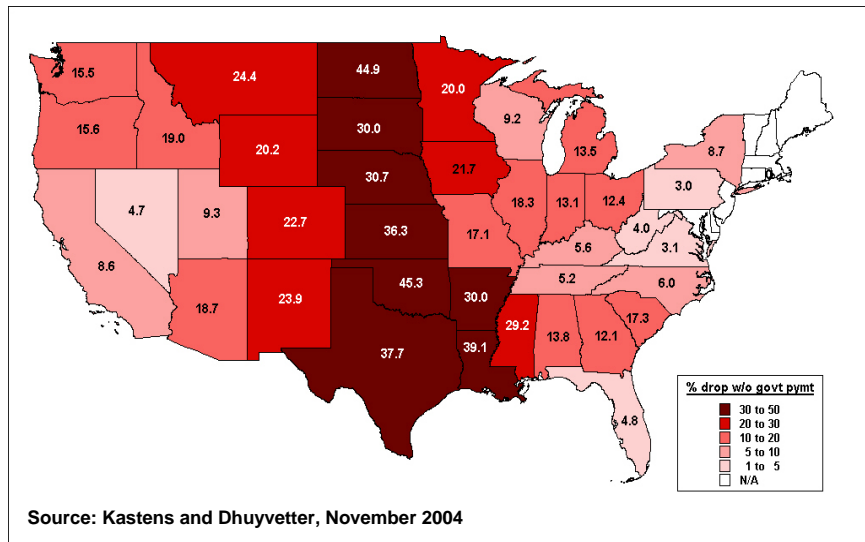
86

## Estimated Reduction in Land Value with the Elimination of Government Programs



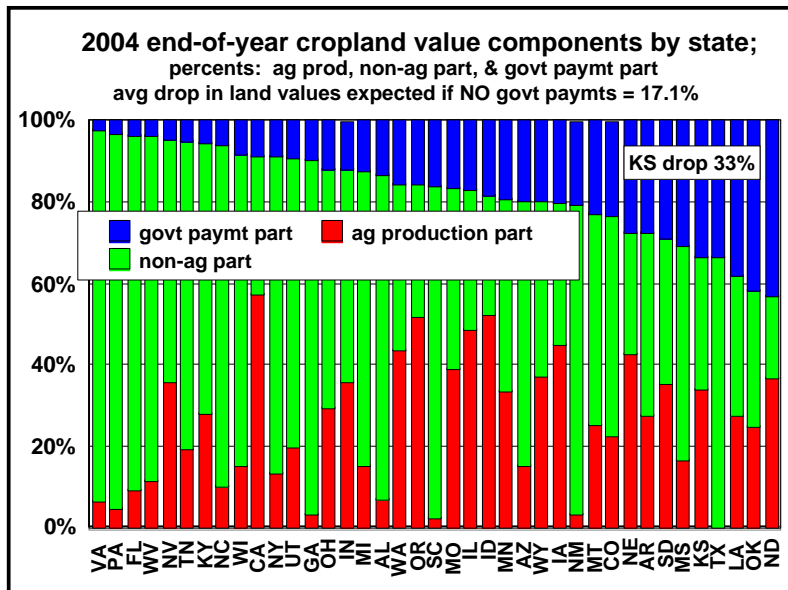
87

## Estimated Reduction in Land Value with the Elimination of Government Programs



last year's map for comparison

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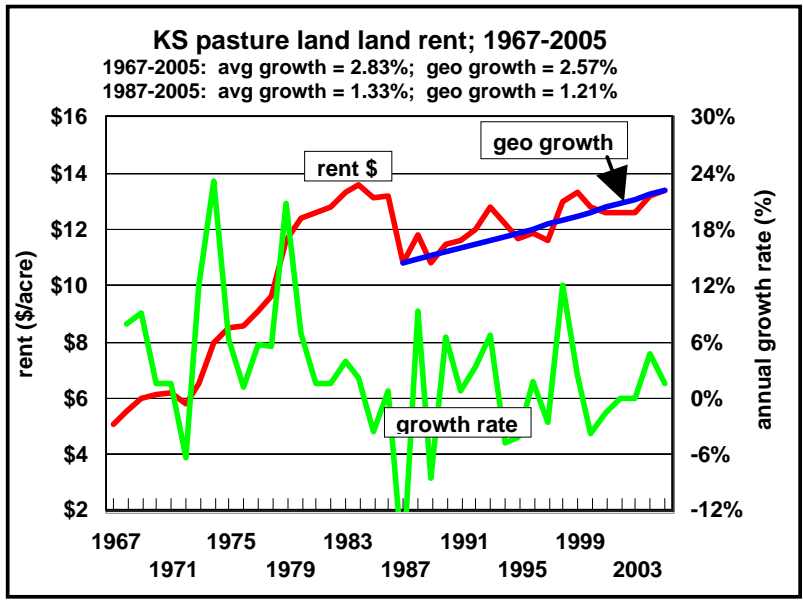
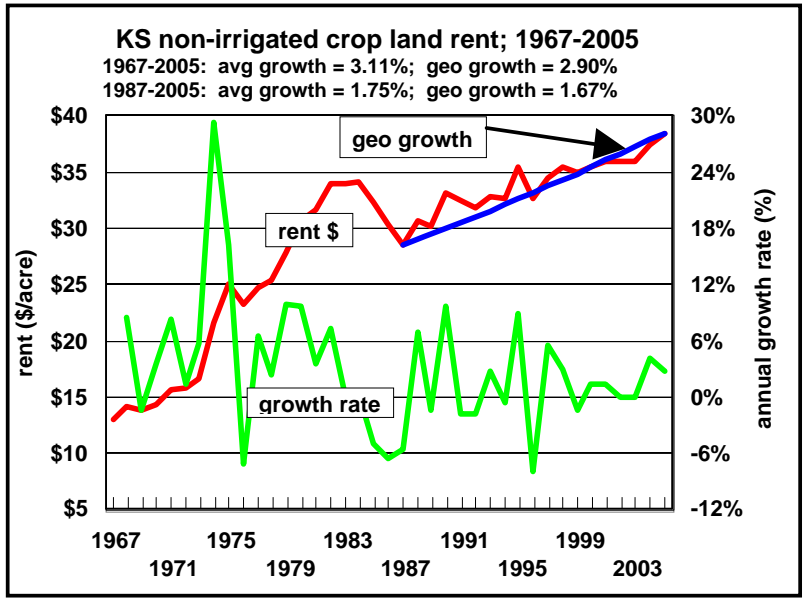
ranked by percent of land value that is due to government program payments

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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, Risk & Profit Conference 2005)
  - Easier to exploit economies of size in level playing field regarding govt payments
  - Increased competition would bolster rents

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## Buying Land – How much can I afford?

- Valuing the capital gains portion
  - Pick a “selling point,” say 30 years from now
  - What will the land be worth then?
    - Assume some annual capital gain % -- ag and non-ag
  - What is left after “sell” & pay cap gains tax?
  - What is that amount worth today?
- Valuing the rent portion
  - What is cash rent today, ag and non-ag?
  - How will rents evolve (grow) over time?
  - What is the future stream of rents worth today?
- Maximum bid = today’s value of the capital gain + today’s value of the rent stream

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Using *KSU-Landbuy*  
(go to Excel)



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# **Questions ???**

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