

## Economics of Tillage Systems



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## No-till (NT) is a technology to consider

### Potential benefits . . .

- **Machinery cost savings**
  - Reduces fuel and labor requirements
- **Allows farm expansion**
  - Dilutes fixed costs (spread over more land)
- **May improve timing**
  - Reduces land preparation time
  - Can increase cropping intensity
- **Related to water savings**
  - Can increase cropping intensity
  - Increases crop yields

## **Speed of technology adoption depends on**

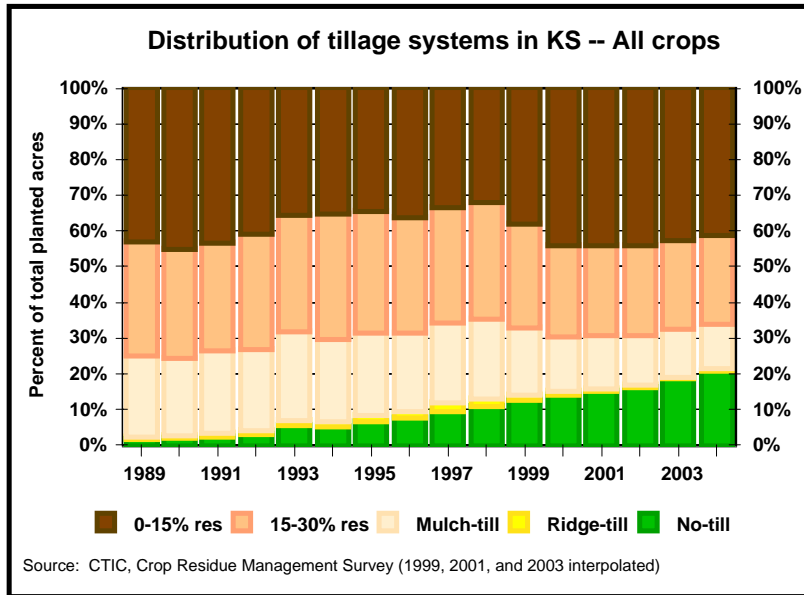
- **Size of the expected profit**
- **Confidence in the outcome**
- **Investment amount required**
- **Keep in mind . . .**
  - Late adopters adopt for survival
  - Early adopters adopt for profit
  - Speed of adoption is important only relative to your neighbors

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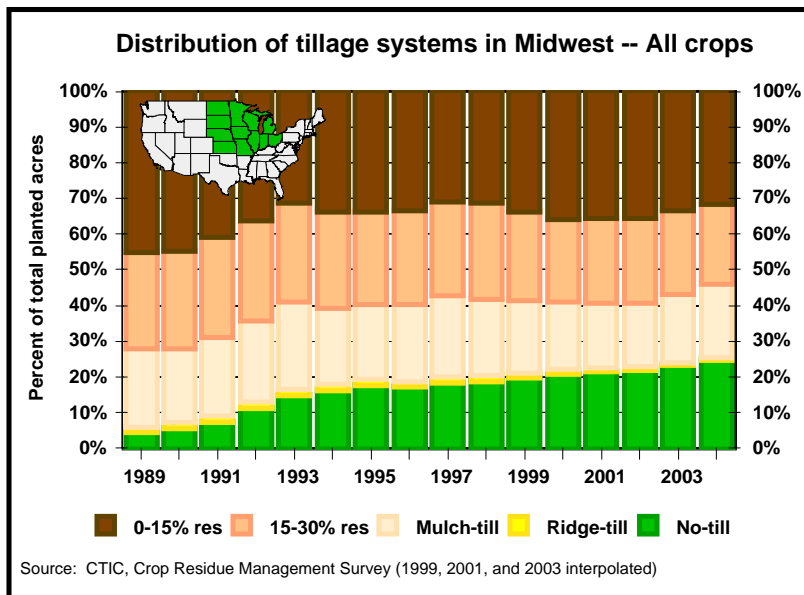
## **Is NT black and white?**

- **NT is not black and white**
  - Moisture savings come from reducing tillage
  - May use NT on one crop and not another in a rotation
- **But, years of soil change can be harmed with one year of tillage**
- **Adopting NT happens in stages for many**
  - Later adopters can skip certain stages
  - But can't "skip" time it takes for soil improvement

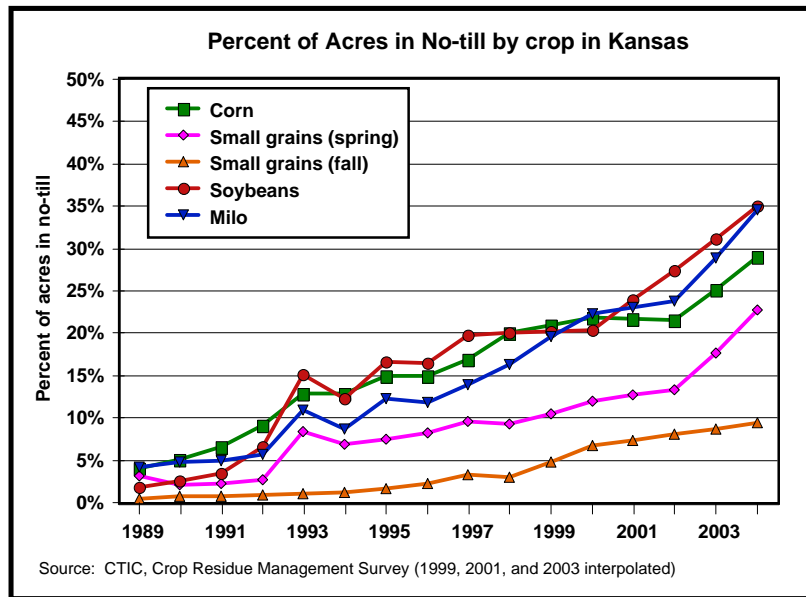
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**Most growth in no-till has come at expense of mulch-till**



**Midwest covers much of Corn Belt (much wetter climate)**



**Crops that grow in summer likely respond better to no-till**

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### **Possible reasons for reducing or eliminating tillage ...**

- ✓ **Increase profitability**
- ✓ **Reduce labor requirements**
- ✓ **Reduce machinery cost/acre**
- ✓ **Increase acres farmed**
- ✓ **Reduce moisture stress/increase yield**
- ✓ **Conservation compliance/soil erosion**
- ✓ **Other (e.g., wildlife, carbon sequestration)**

## Profitability ...

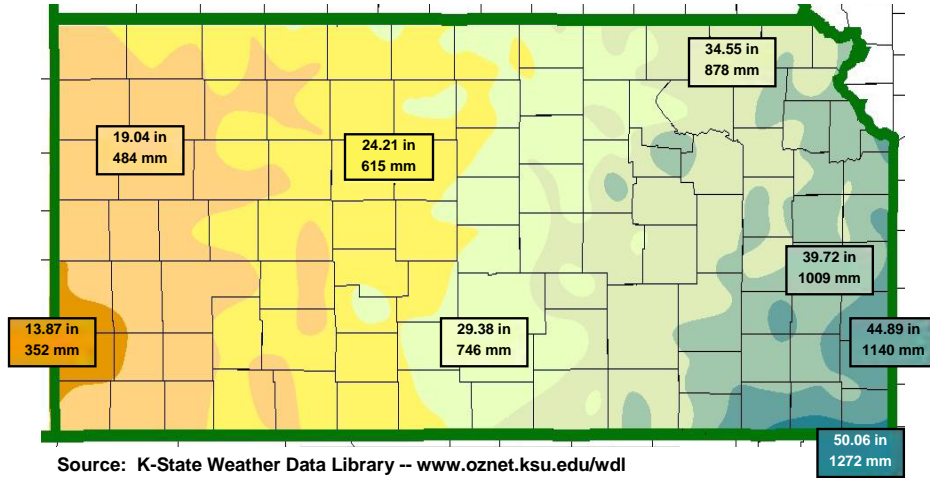
$$\begin{array}{r} \text{Revenue (yield x price)} \\ - \text{Cost (variable and fixed)} \\ \hline \text{Profit or net returns} \end{array}$$

Tillage won't impact price, thus profitability will depend on how yields and costs are affected by reducing tillage.

## Effect of no-till on *YIELDS*



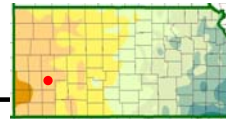
## Kansas Annual Precipitation, 1971-2000



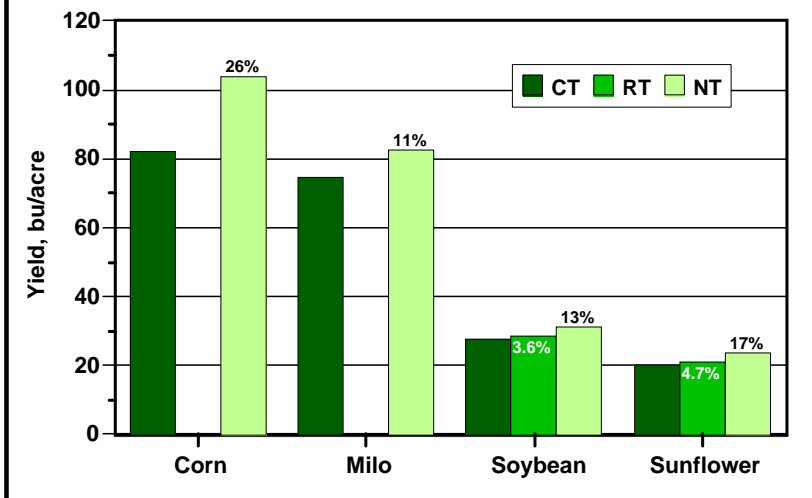
14

### K-State research data

(19.0 in annual precipitation region)

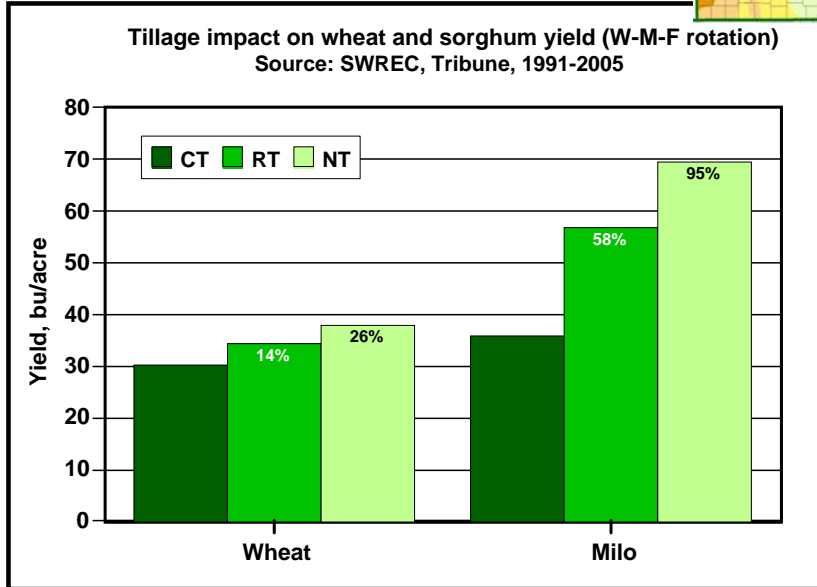
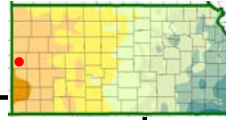


Tillage impact on yield -- wheat/row crop/fallow rotation  
Source: SWREC, Garden City, 1991-1997

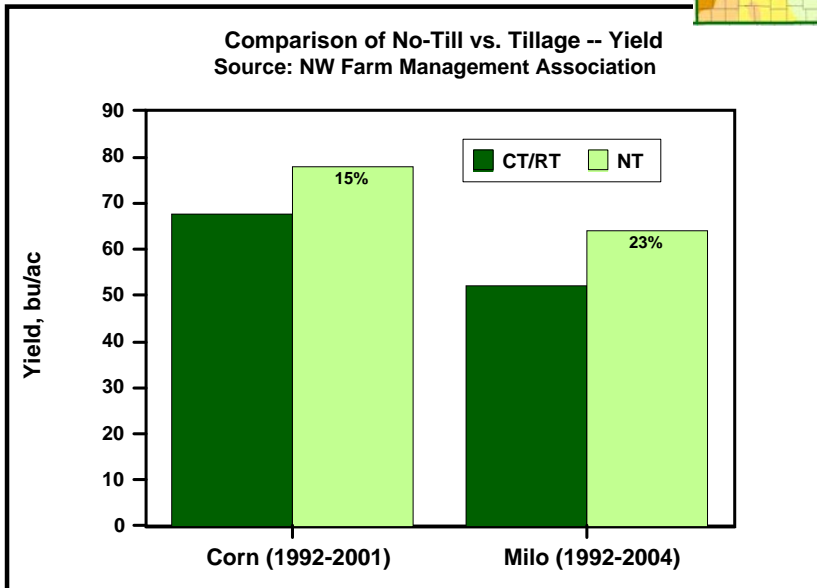
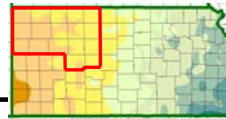


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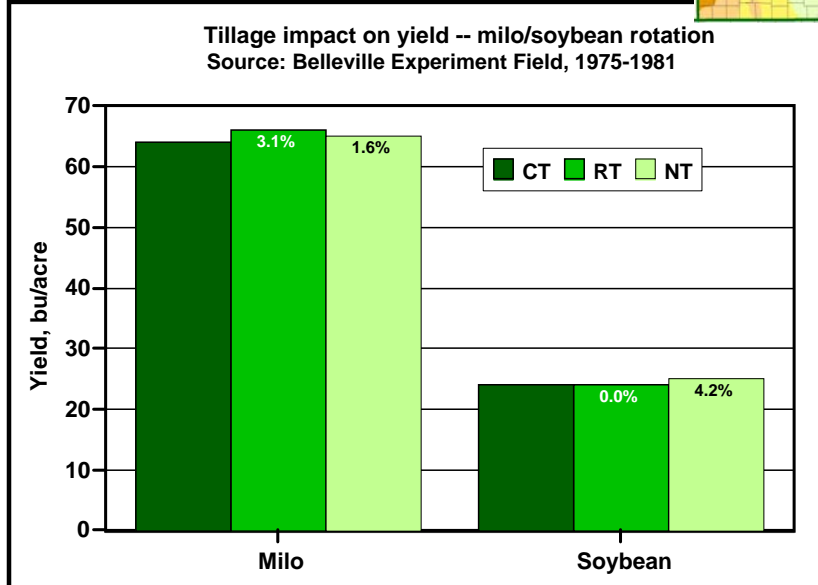
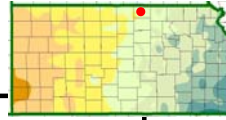
**K-State research data**  
**(19.0 in annual precipitation region)**



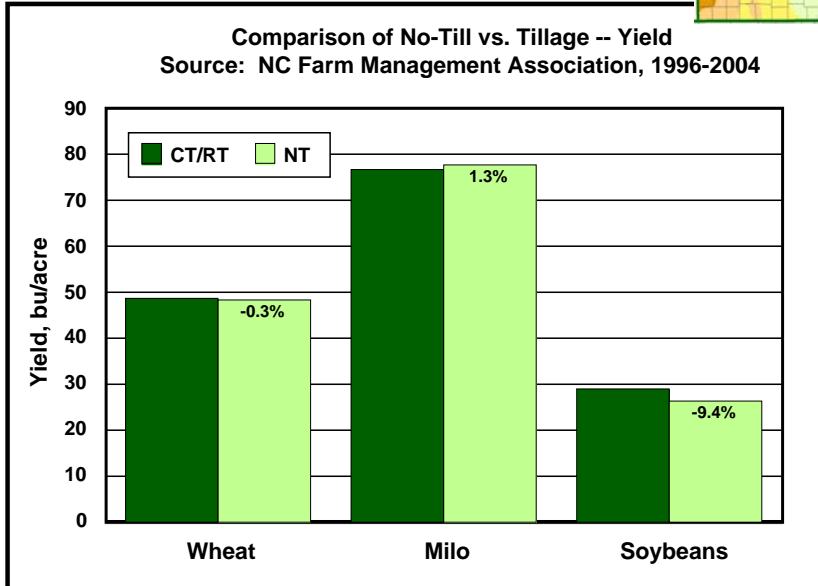
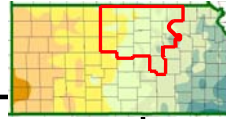
**Farm-level data**  
**(19.0-24.2 in annual precipitation region)**



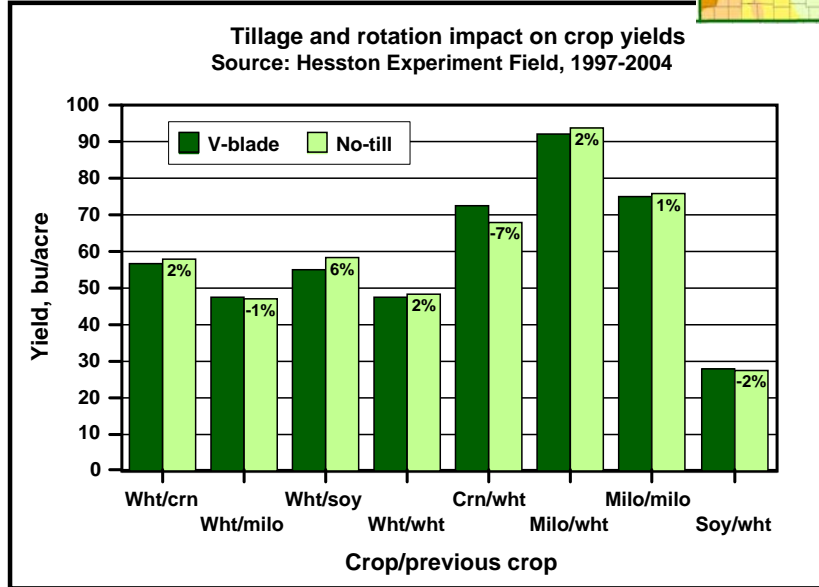
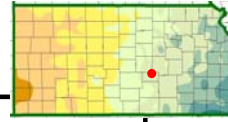
**K-State research data**  
**(29.4 in annual precipitation region)**



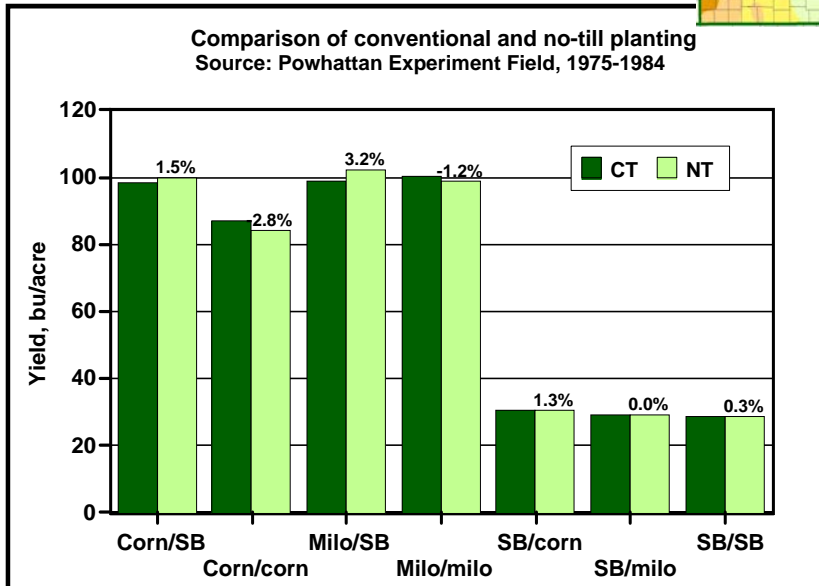
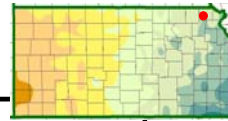
**Farm-level data**  
**(24.2-34.6 in annual precipitation region)**



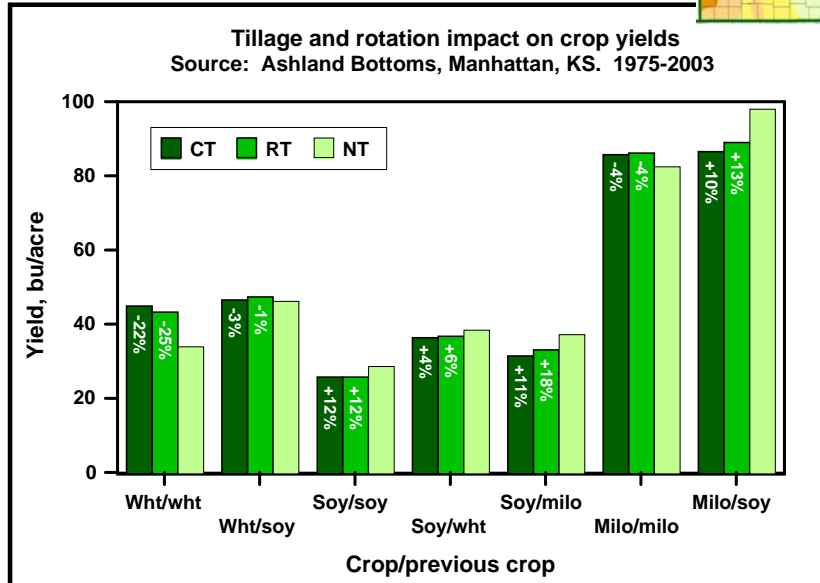
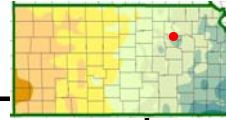
**K-State research data**  
**(29.4-34.6 in annual precipitation region)**



**K-State research data**  
**(34.6 in annual precipitation region)**

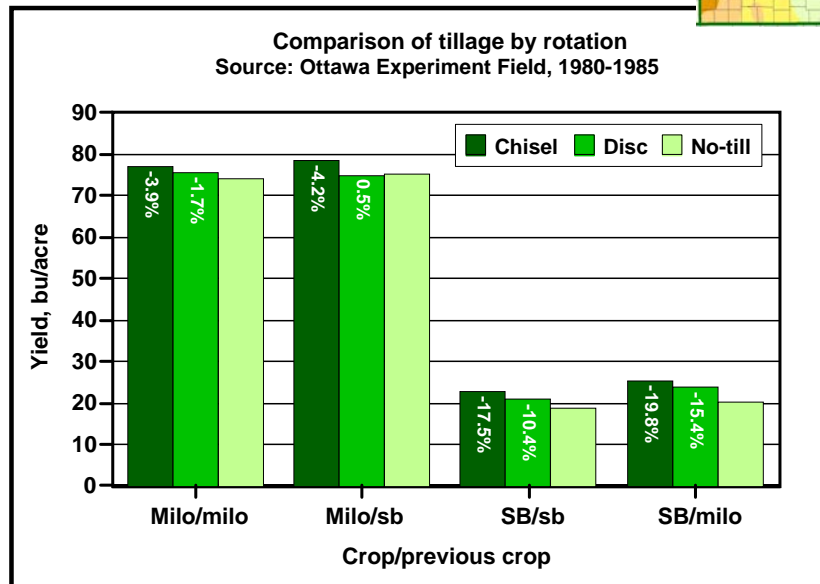
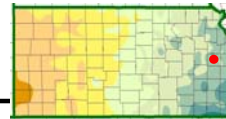


**K-State research data**  
**(34.6-39.7 in annual precipitation region)**



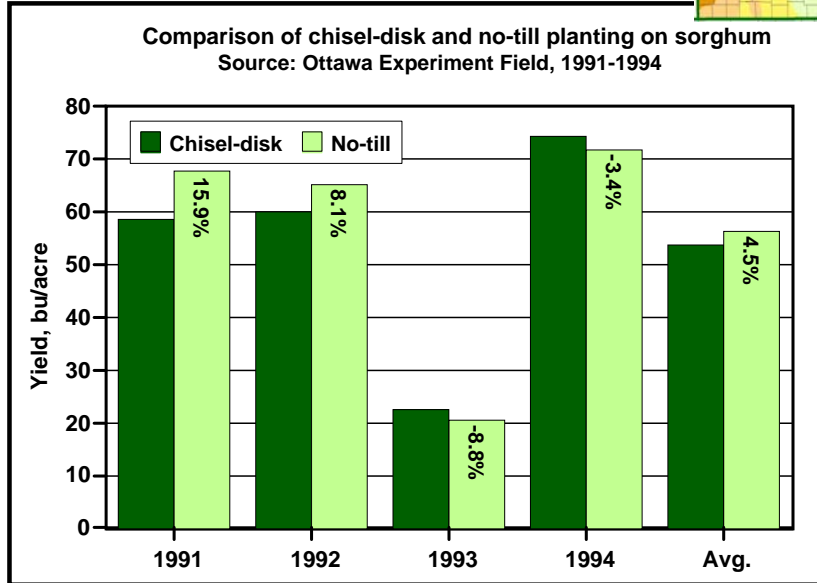
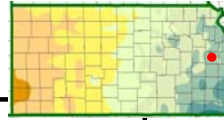
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**K-State research data**  
**(39.7 in annual precipitation region)**

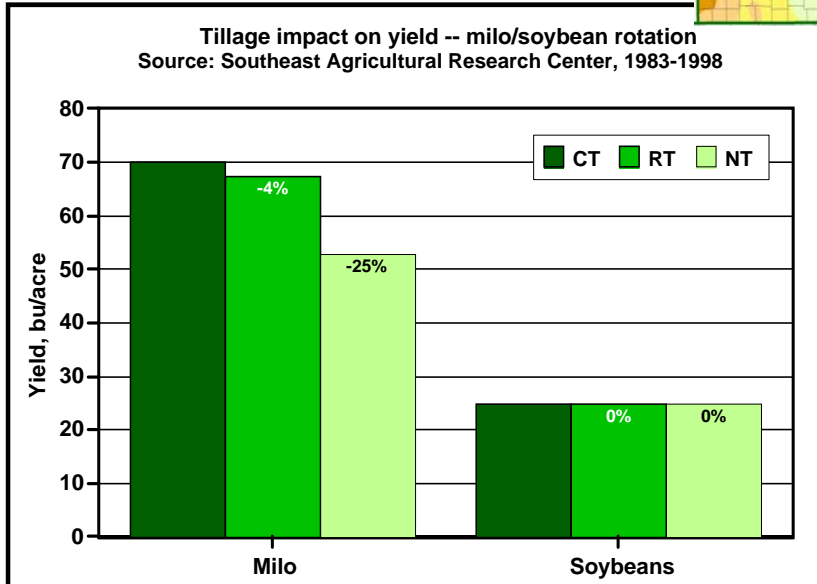
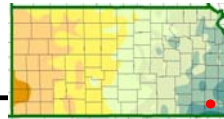


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**K-State research data**  
**(39.7 in annual precipitation region)**



**K-State research data**  
**(44.9-50.1 in annual precipitation region)**



## Effect of tillage on yields?

Research in central and eastern Kansas generally has shown little yield difference between tillage systems for wheat, milo, soybeans, and corn (possible yield reductions in EC and SE) => **NT cost driven.**

Research in western Kansas has shown that yields increase as tillage is reduced, especially for summer crops such as corn and milo => **NT revenue driven.**

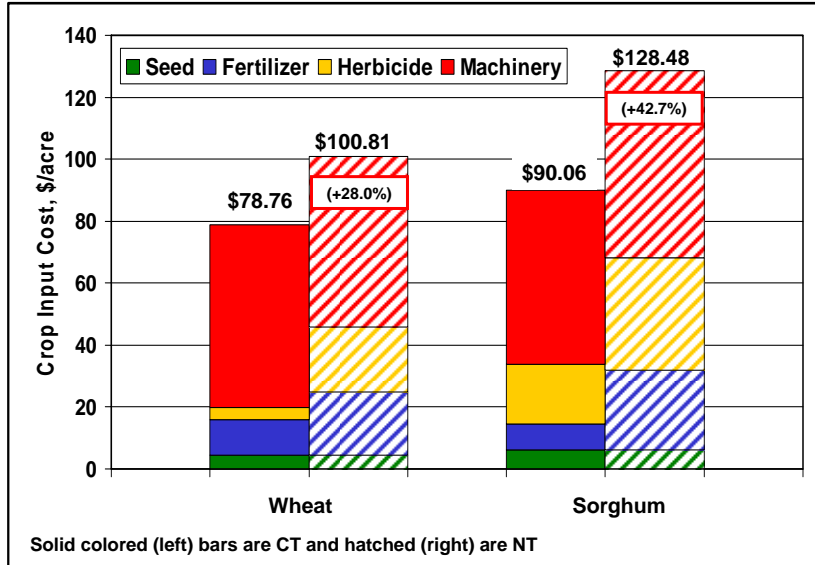
## Effect of no-till on COSTS

- Projected/simulated budgets
- Actual farm-level data



K-State projected budgets

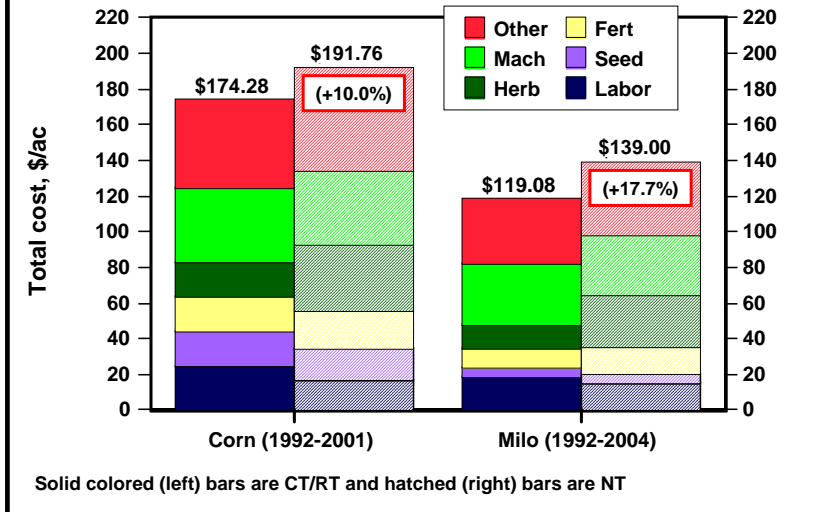
Tribune WSF Crop Input Costs



Actual farm-level data

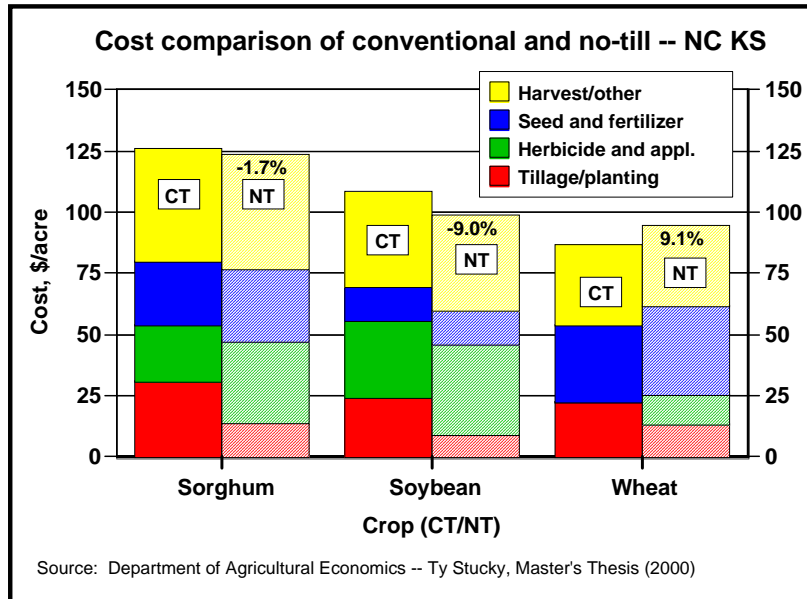
Comparison of No-Till vs. Tillage -- Costs

Source: NW Farm Management Association



Higher yields allow adoption of this more costly technology

## K-State projected budgets



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## Actual farm-level data

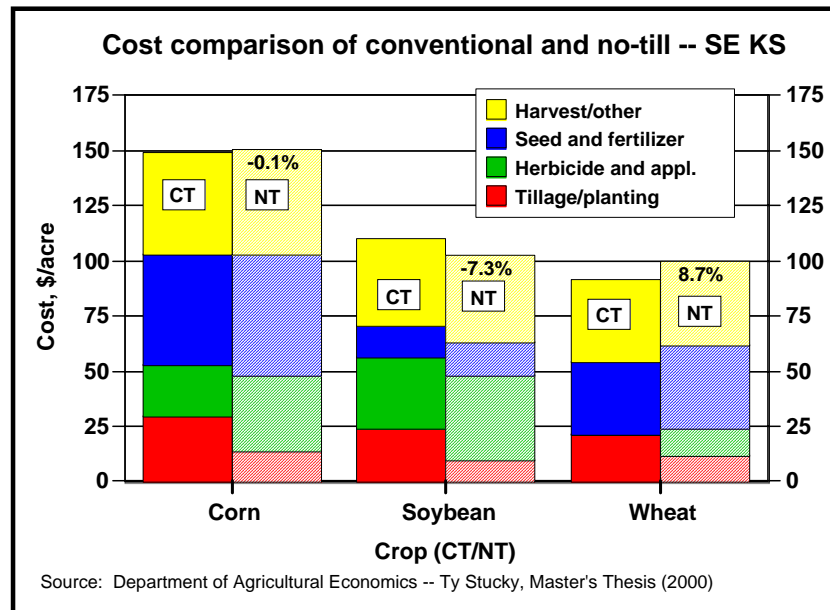
### No-Till cost study - NC Farm Management Association, 1996-2004

EXPENSE ITEM, \$/acre	\$/land acre		\$/harvested acre	
	CT/RT	NT	CT/RT	NT
Direct input (seed, fert, chem, etc)	\$41.26	\$55.41	\$42.04	\$53.37
Machinery cost	\$39.44	\$35.60	\$40.24	\$34.27
Labor	\$28.35	\$24.42	\$28.95	\$23.50
Total asset charge	\$38.59	\$38.03	\$39.38	\$36.63
Building and conservation	\$2.99	\$2.09	\$3.06	\$2.01
Other	\$11.94	\$9.09	\$12.18	\$8.75
<b>Total expense</b>	<b>\$162.58</b>	<b>\$164.63</b>	<b>\$165.84</b>	<b>\$158.53</b>
<b>Total acres</b>	<b>938</b>	<b>1,212</b>	<b>908</b>	<b>1,256</b>
<b>Harvested acres/land acres</b>	<b>xxxxx</b>	<b>xxxxx</b>	<b>96.8%</b>	<b>103.6%</b>

**NT farms are cropping more intensively**

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## K-State projected budgets



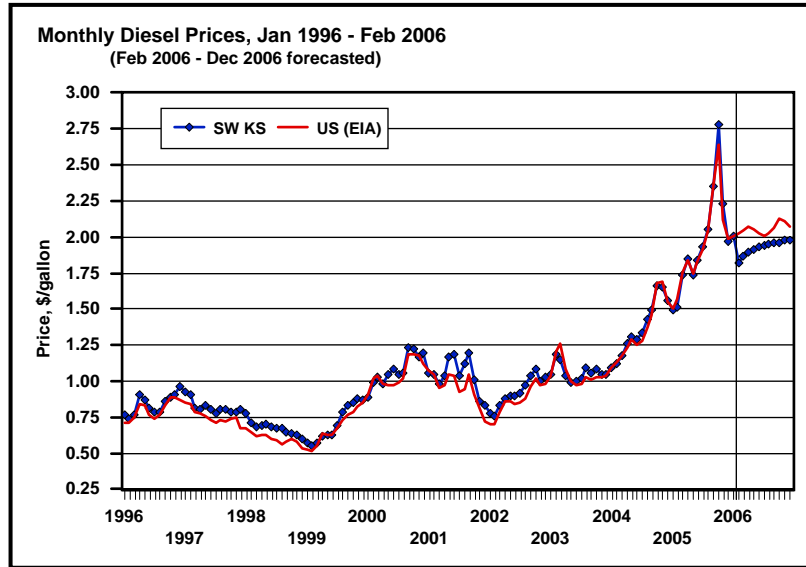
34

## Effect of no-till on costs

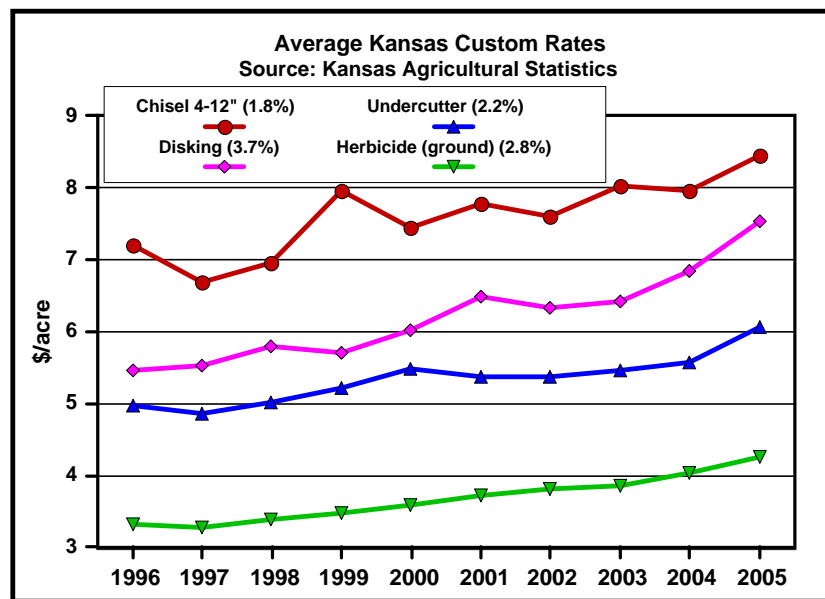
- Central and eastern KS data indicate slight decrease to little change in total costs if acreage is held constant. Western KS data suggest costs increase with NT compared to CT.
- Changes cost "structure" --- i.e., herbicide is substituted for tillage-related expenses.
- Fixed costs (land, machinery, management, etc.) will depend on acreage and thus will vary between producers.

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**Diesel prices are forecasted to be below 2005 peak level, but they are still at historically high levels ...**



Based on 2/16/06 futures closing prices



USDA-NRCS Energy Consumption Awareness Tool: Tillage - Microsoft Internet Explorer

Address: http://ecat.sc.egov.usda.gov/Default.aspx



United States Department of Agriculture  
Natural Resources Conservation Service

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You are here: Home

### Welcome to Energy Estimator: Tillage

Energy Estimator for Tillage is the first of several tools from Natural Resources Conservation Service (NRCS) developed to increase energy awareness in agriculture. The tool estimates diesel fuel use and costs in the production of key crops in your area and compares potential energy savings between conventional tillage and alternative tillage systems. The crops covered are limited to the most predominant crops in 74 Crop Management Zones (CMZ's). NRCS agronomists have identified these crops and estimated the fuel use associated with common tillage systems. Without including every crop and tillage system, the Energy Estimator gives you an idea of the magnitude of diesel fuel savings under different levels of tillage.

**Step 1: Zip Code**

Begin using this tool by entering your zip code, then click CONTINUE:

Zip Code \* : 66749

**Impact of reducing tillage -- http://ecat.sc.egov.usda.gov/Default.aspx**

USDA-NRCS Energy Consumption Awareness Tool: Tillage - Microsoft Internet Explorer

Address: http://ecat.sc.egov.usda.gov/Cost.aspx?UnitPrice=1.99

Home About Estimator Help Contact Us

You are here: Home / Step 2: Crop Zone / Step 3: Fuel / Step 4: Cost

### Step 4: Fuel Cost

If you want to checkout different fuel prices, enter a different price per gallon and click "RECALCULATE": \$ 1.99

Total Diesel Fuel Cost Estimate (in dollars per year) based on \$1.99/gallon

Crop	Acres	Conventional Tillage	Mulch-Till	Ridge-Till	No-Till
Corn	33.34	\$334	\$277	\$221	\$183
Soybeans	33.33	\$334	\$277	\$219	\$129
Wheat	33.33	\$328	\$271		\$129
<b>Total Fuel Cost</b>		\$997	\$824	\$440	\$442
<b>Potential Cost Savings over Conventional Tillage</b>			\$173	\$229	\$555

Total Farm Diesel Fuel Consumption Estimate (in gallons per year)

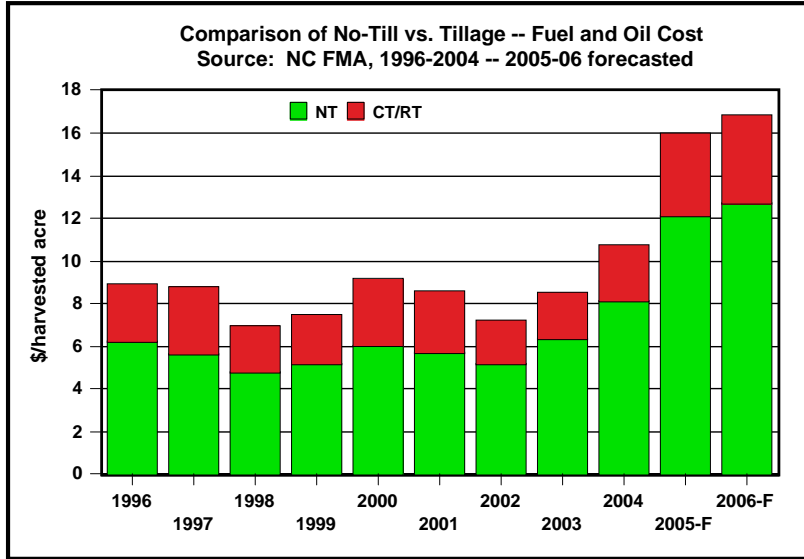
Crop	Acres	Conventional Tillage	Mulch-Till	Ridge-Till	No-Till
Corn	33.34	168	139	111	92
Soybeans	33.33	168	139	110	65
Wheat	33.33	165	136		65
<b>Total Fuel Use</b>		501	414	221	222
<b>Potential Fuel Savings over Conventional Tillage</b>			87	115	279
<b>Savings</b>			17%	23%	56%

**Savings of \$5.55/a vs CT (\$3.82 vs MT) (based on average crop mix in region)**

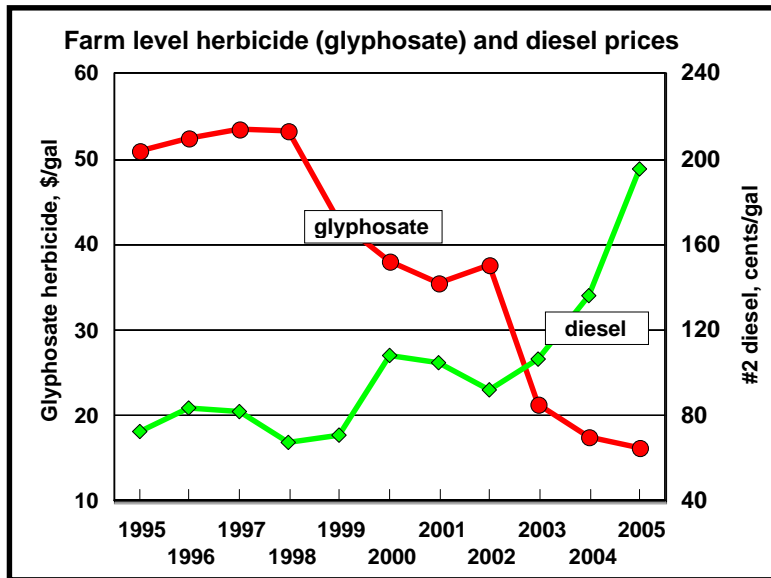
Back Print Start Over

Last Modified: 12/06/2005

**Fuel-savings benefit of no-till increases at higher prices...**



NT fuel generally 67-75% of CT/RT, savings could be as high as \$4/acre at current diesel prices...



Trends favor herbicides over tillage – increase speed of adoption?

## Profitability ...

$$\frac{\text{Revenue (yield x price)} - \text{Cost (variable and fixed)}}{\text{Profit or net returns}}$$

Western Kansas – higher yields and higher costs

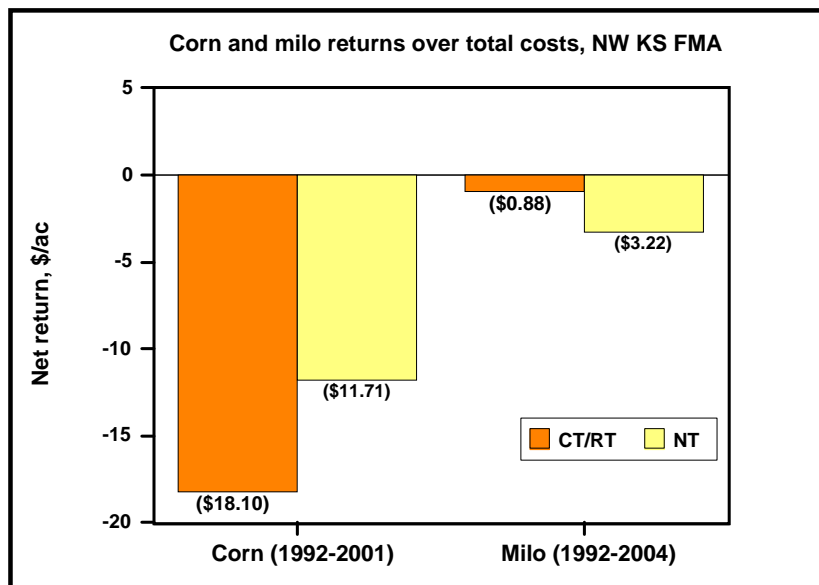
Central / eastern Kansas – similar yields & costs

Profitability complicating factors:

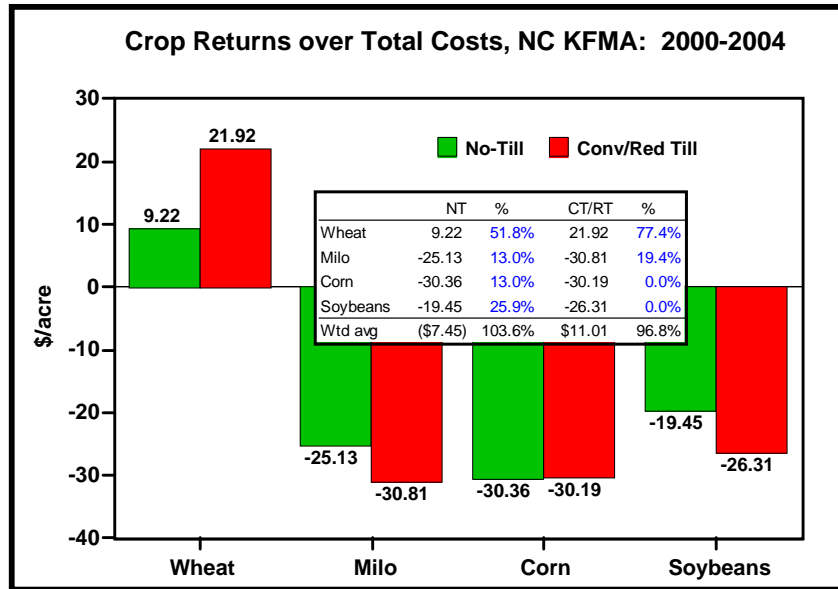
- Cropping intensity
- Farm size
- Tillage x rotation interaction

NT adoption is increasing, suggesting profitability

### Actual farm-level data



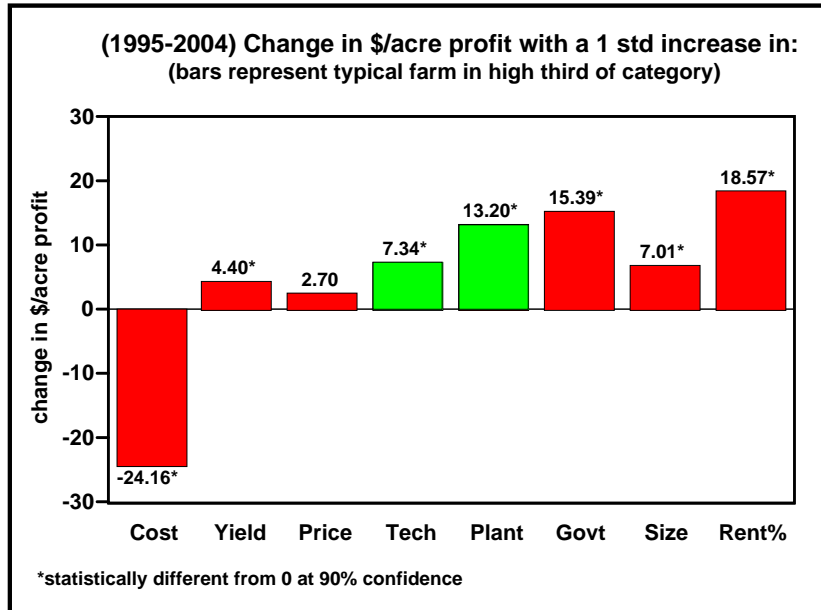
Actual farm-level data



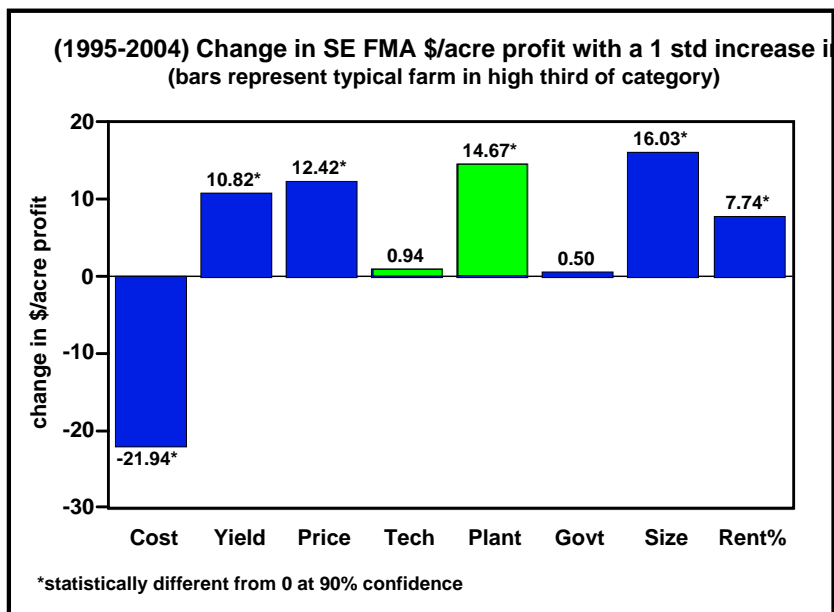
**Economic analysis using Kansas Farm Management data**

- Which management factors impact profitability?
- 10 years of data (1995-04)
- Approximately 900 farms
- Analysis focuses on crop producers

Factors affecting profits (State KFMA) ...



Factors affecting profits (SE KFMA) ...



The screenshot shows a web browser window with the address bar displaying <http://notill.org/cgi-bin/anyboard.cgi?fvp=/anyboard9/talk/&cmd=vXz&pgno=6&t=L1023>. The page title is "Talk About" No-Till by No-Till On The Plains. The main content area features a forum thread titled "compaction layer at 18 in??". The thread includes several replies from users like Matt Hagney, John, Knox, Dietrich, and Todd Miller. A text box is overlaid on the forum thread with the text: "Resources are 'out there' to learn how no-till works for other producers across Kansas." The browser's taskbar shows several open applications, including Windows Explorer, Microsoft Outlook, and Microsoft PowerPoint.

## Questions ???

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