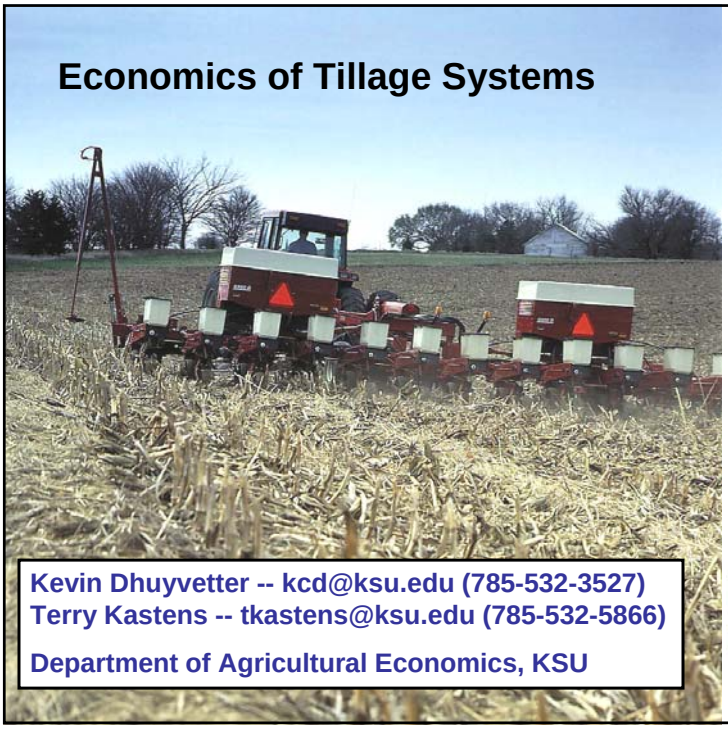
Economics of Tillage Systems



Kevin Dhuyvetter -- kcd@ksu.edu (785-532-3527)
Terry Kastens -- tkastens@ksu.edu (785-532-5866)

Department of Agricultural Economics, KSU

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No-till (NT) is a technology to consider

Potential benefits . . .

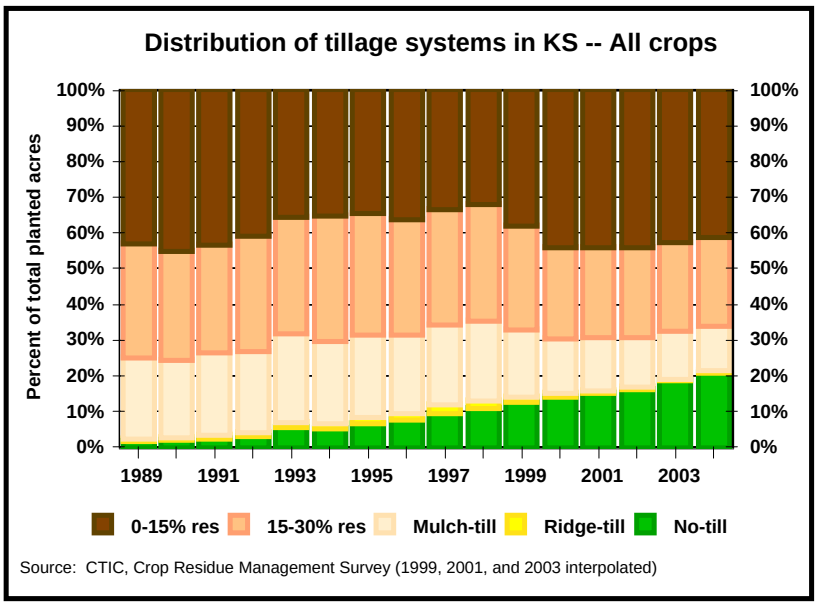
- Machinery cost savings
  - Reduces fuel and labor requirements
- Allows farm expansion
  - Dilutes fixed costs (spread over more land)
- May improve timing
  - Reduces land preparation time
  - Can increase cropping intensity
- Related to water savings
  - Can increase cropping intensity
  - Increases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

Speed of technology adoption depends on

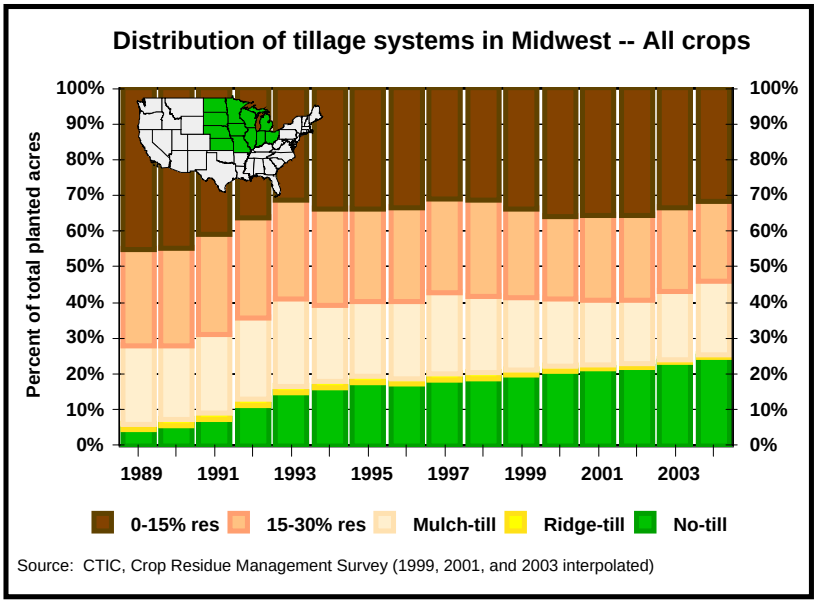
- Size of the expected profit
- Confidence in the outcome
- Investment amount required
- Keep in mind . . .
  - Late adopters adopt for survival
  - Early adopters adopt for profit
  - Speed of adoption is important only relative to your neighbors

Is NT black and white?

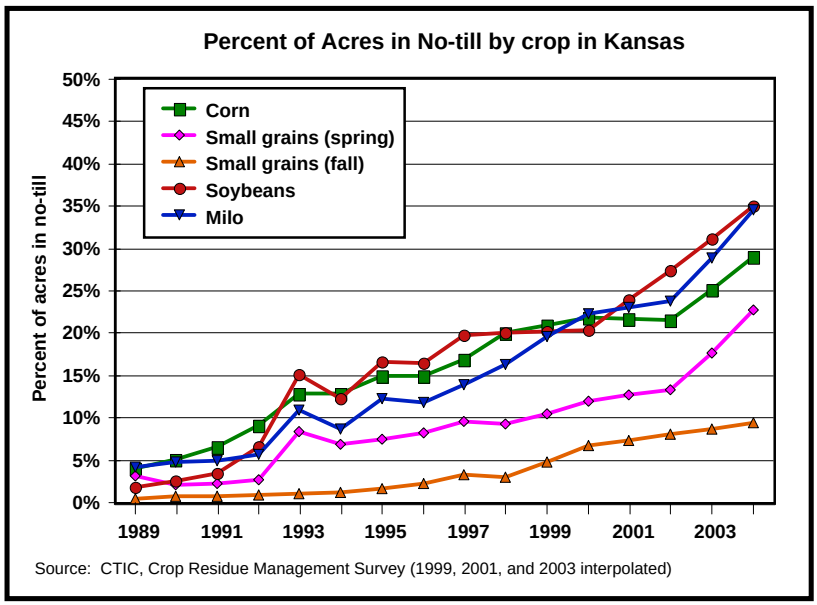
- NT is not black and white
  - Moisture savings come from reducing tillage
  - May use NT on one crop and not another in a rotation
- But, years of soil change can be harmed with one year of tillage
- Adopting NT happens in stages for many
  - Later adopters can skip certain stages
  - But can't "skip"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



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



Midwest covers much of Corn Belt (much wetter climate)



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

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

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 ...

Revenue (yield x price)

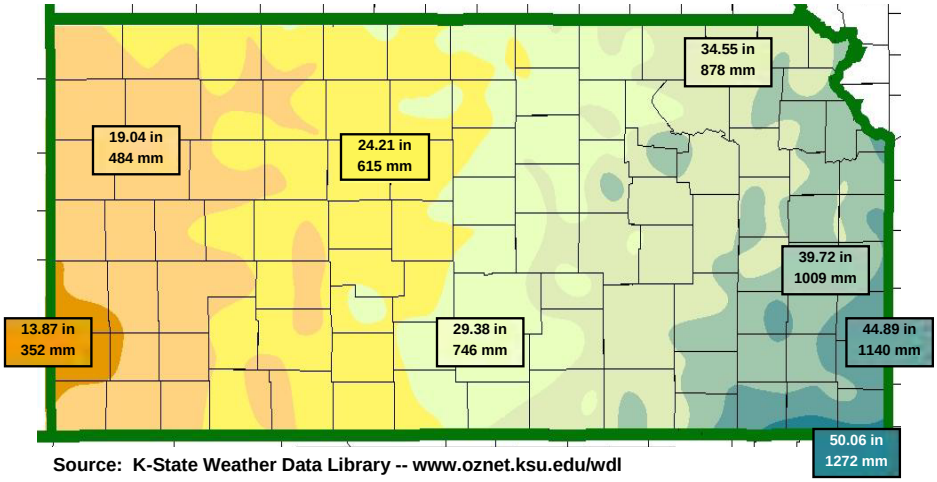
\- Cost (variable and fixed)

Profit or net returns

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*

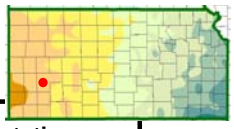
Kansas Annual Precipitation, 1971-2000

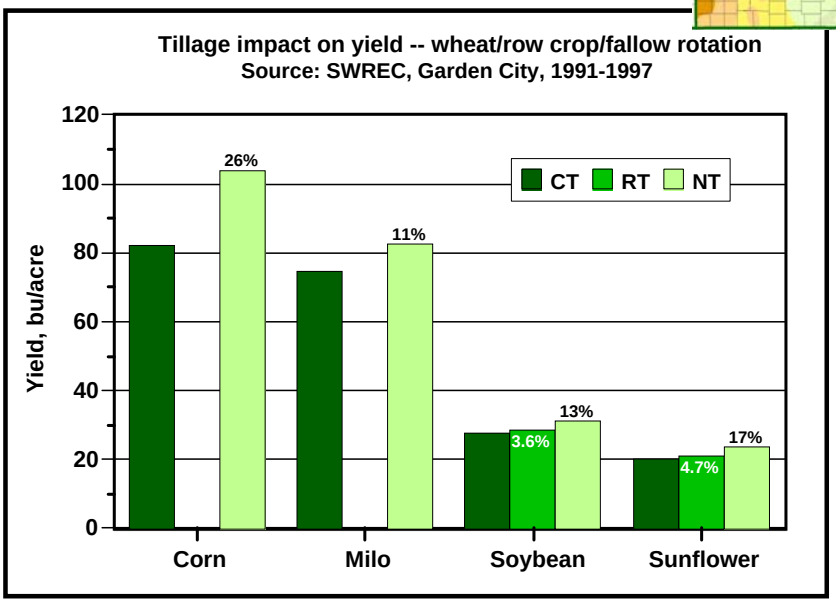


Source: K-State Weather Data Library -- www.oznet.ksu.edu/wdl

K-State research data

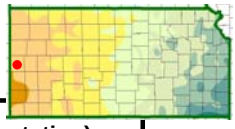
(19.0 in annual precipitation region)

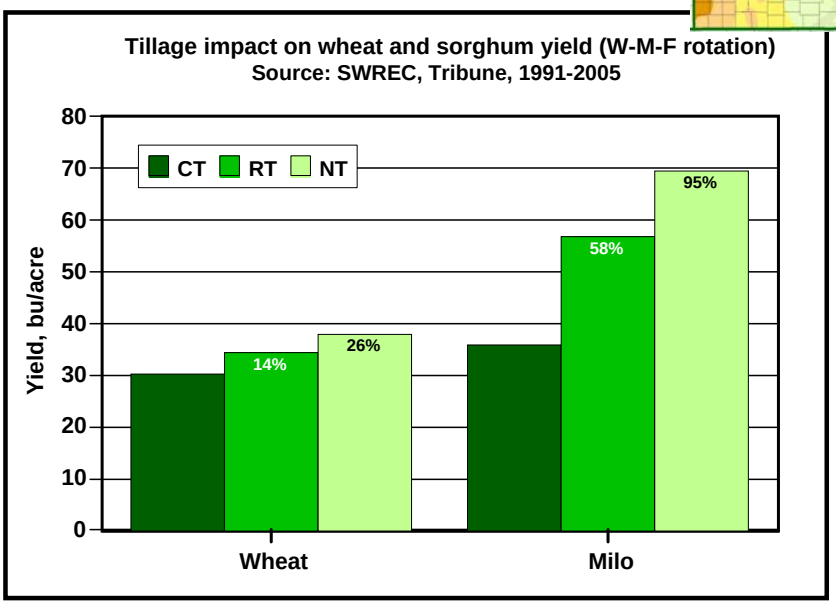




K-State research data

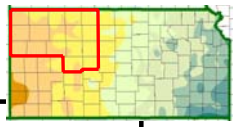
(19.0 in annual precipitation region)

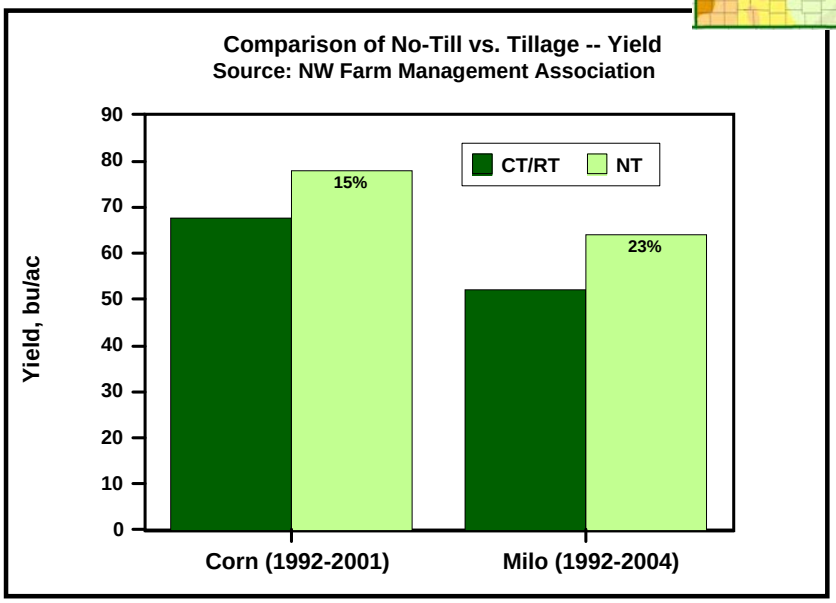




Farm-level data

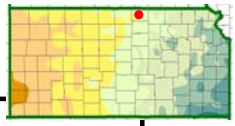
(19.0-24.2 in annual precipitation region)

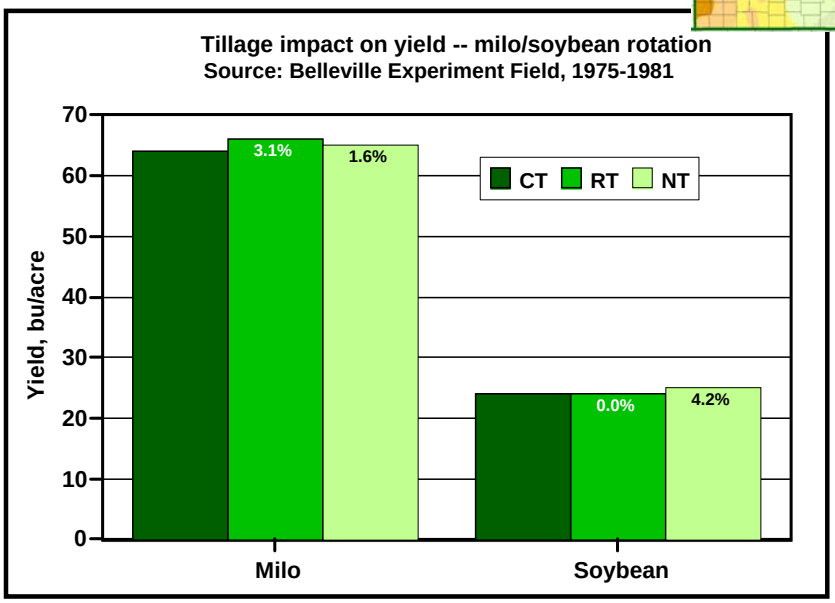




K-State research data

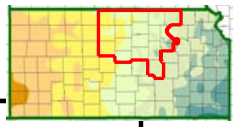
(29.4 in annual precipitation region)

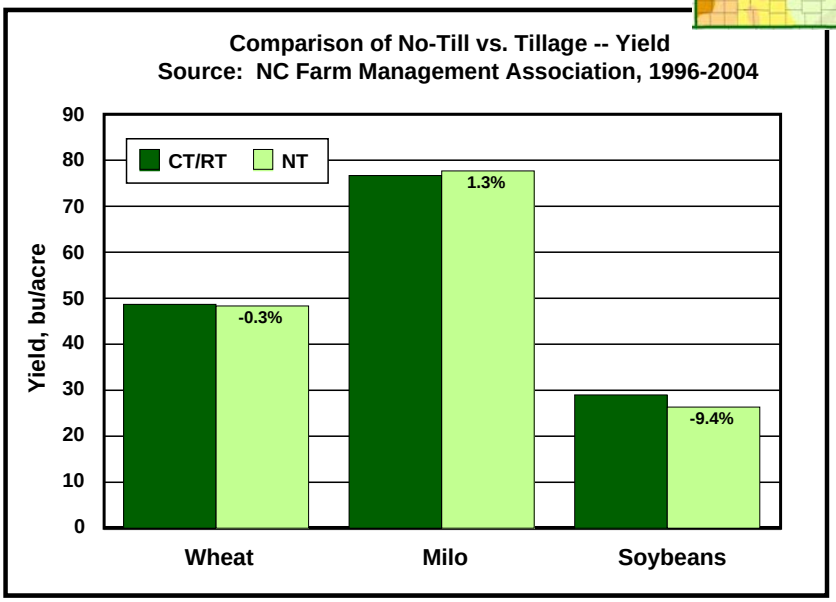




Farm-level data

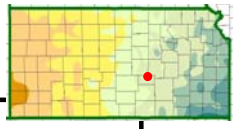
(24.2-34.6 in annual precipitation region)

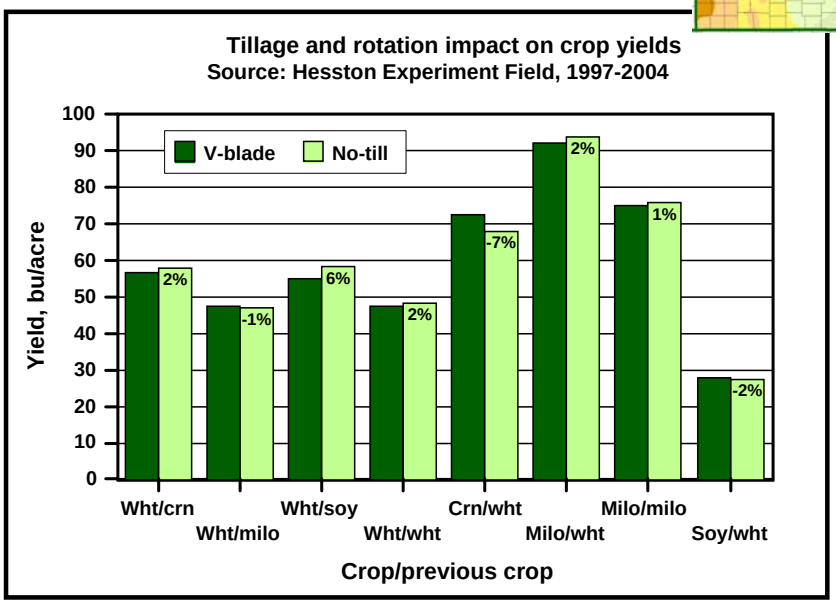




K-State research data

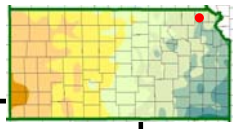
(29.4-34.6 in annual precipitation region)

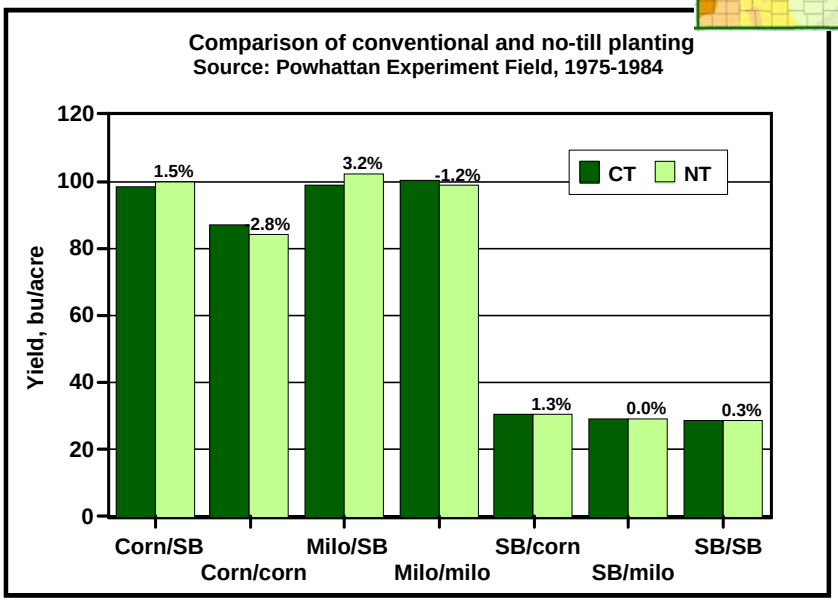




K-State research data

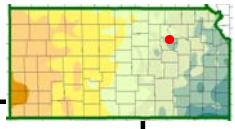
(34.6 in annual precipitation region)

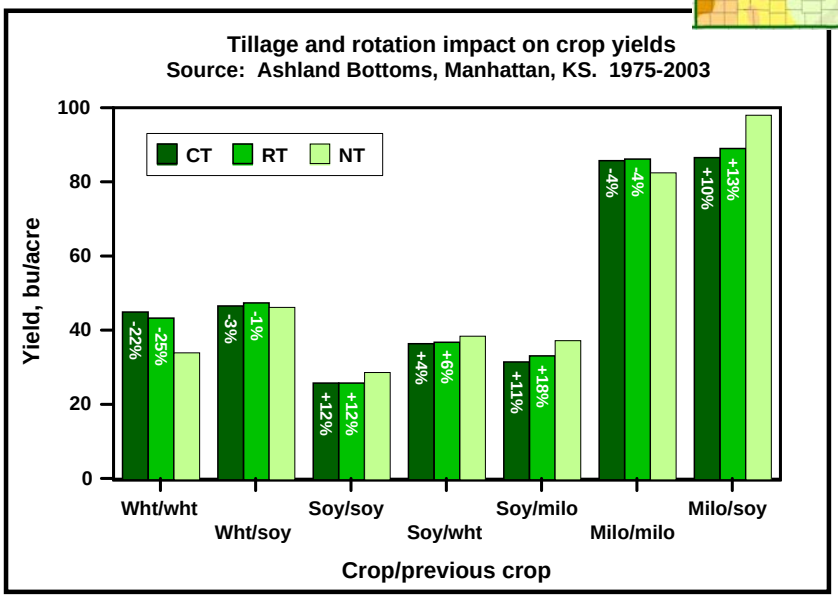




K-State research data

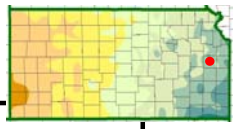
(34.6-39.7 in annual precipitation region)

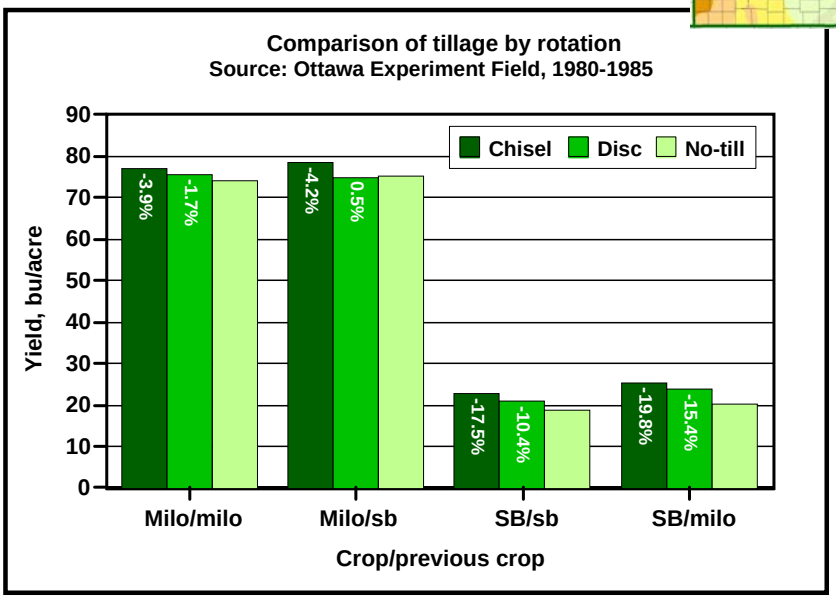




K-State research data

(39.7 in annual precipitation region)





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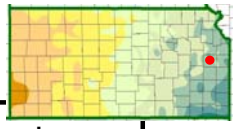
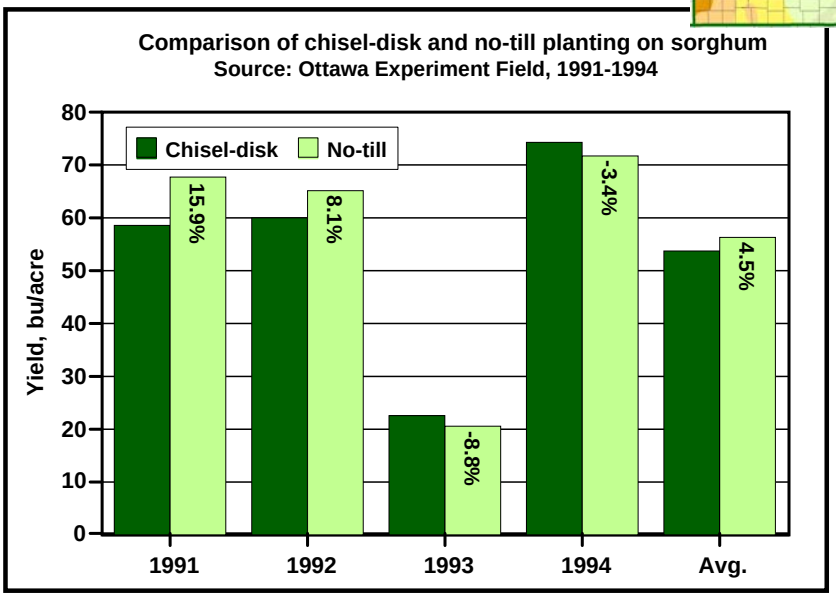
(39.7 in annual precipitation region)

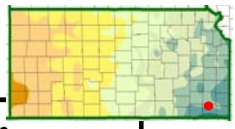


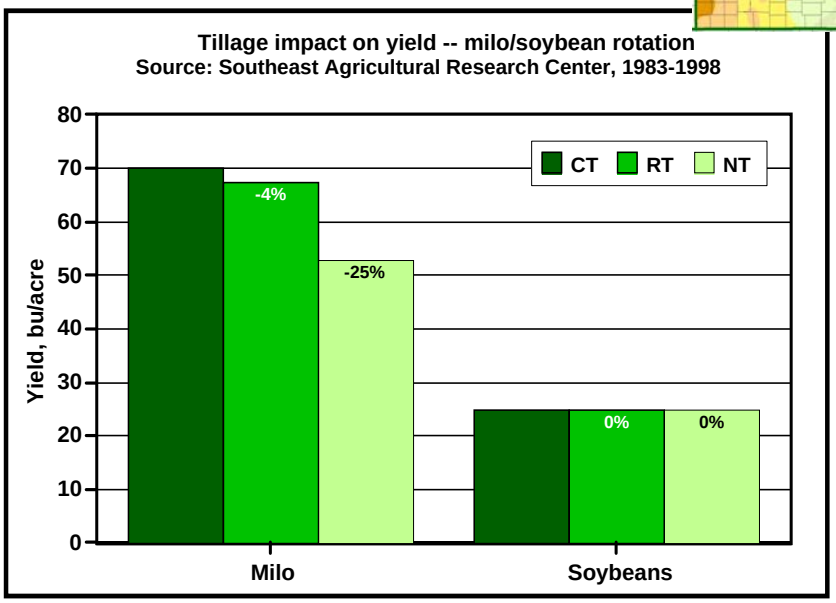


25

K-State research data

(44.9-50.1 in annual precipitation region)





26

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.

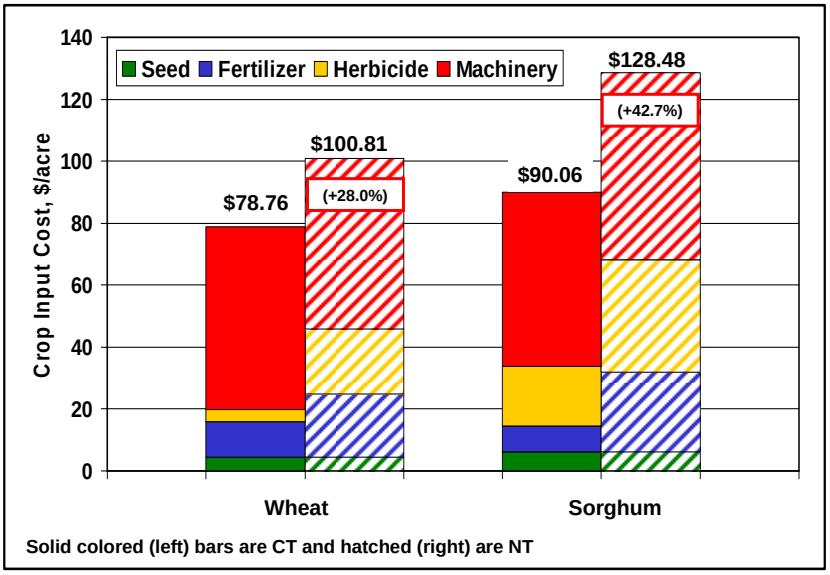
Research in western Kansas has shown that yields increase as tillage is reduced, especially for summer crops such as corn and milo => NT revenue driven.

Effect of no-till on *COSTS*

- **Projected/simulated budgets**
- **Actual farm-level data**

K-State projected budgets

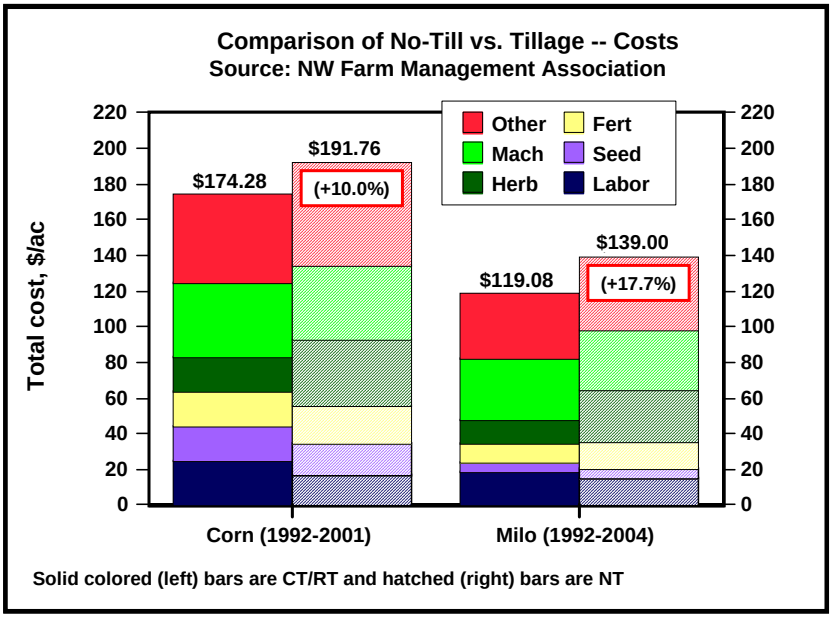
Tribune WSF Crop Input Costs



Solid colored (left) bars are CT and hatched (right) are NT

29

Actual farm-level data

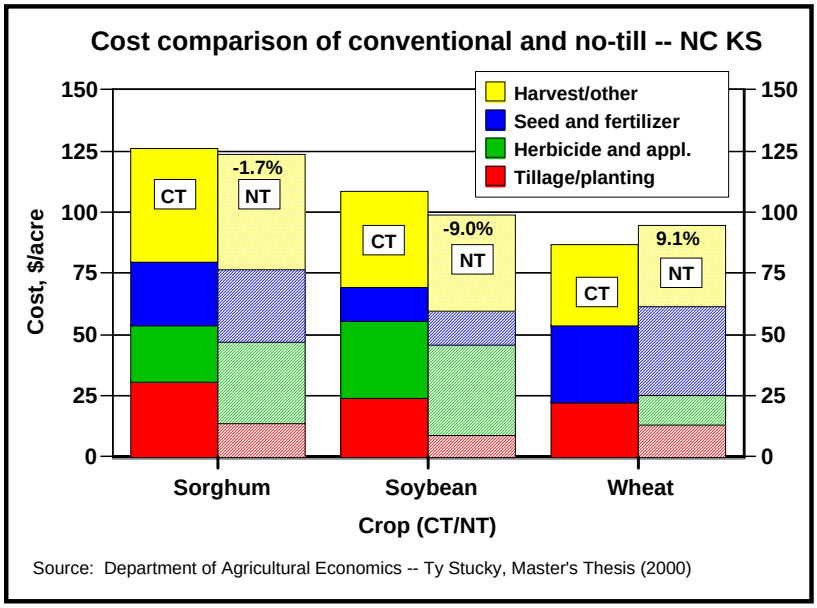


Solid colored (left) bars are CT/RT and hatched (right) bars are NT

Higher yields allow adoption of this more costly technology

31

K-State projected budgets



Source: Department of Agricultural Economics -- Ty Stucky, Master's Thesis (2000)

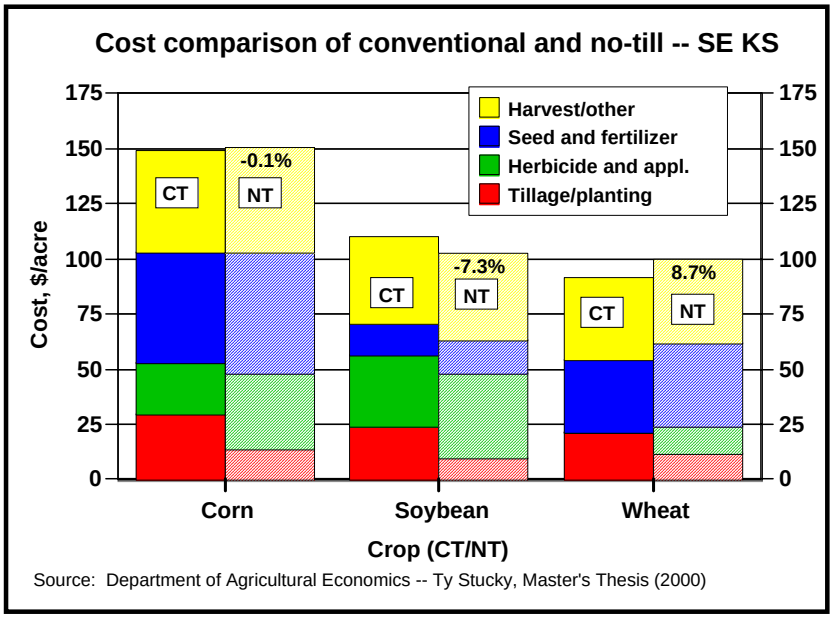
Actual farm-level data

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

	$/land acre		$/harvested acre	
EXPENSE ITEM, $/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
Total expense	$162.58	$164.63	$165.84	$158.53
Total acres	938	1,212	908	1,256
Harvested acres/land acres	xxxxx	xxxxx	96.8%	103.6%

NT farms are cropping more intensively

K-State projected budgets

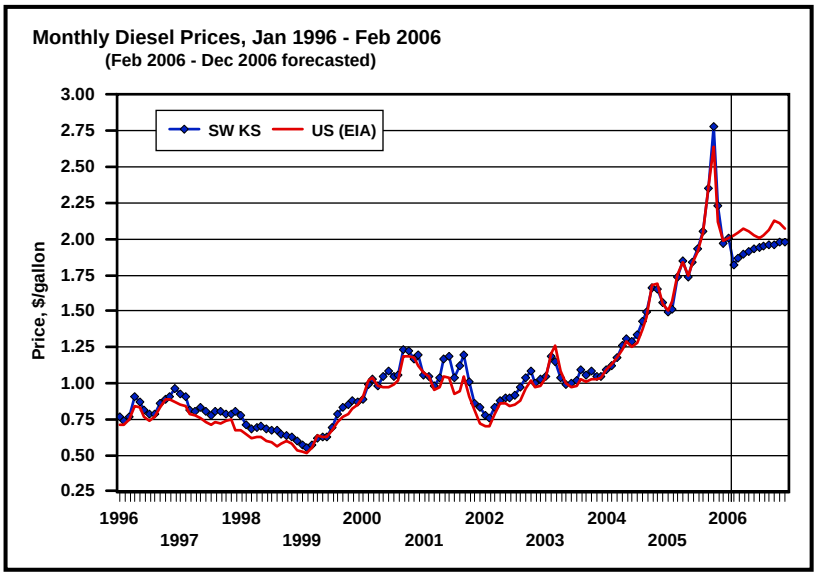


Source: Department of Agricultural Economics -- Ty Stucky, Master's Thesis (2000)

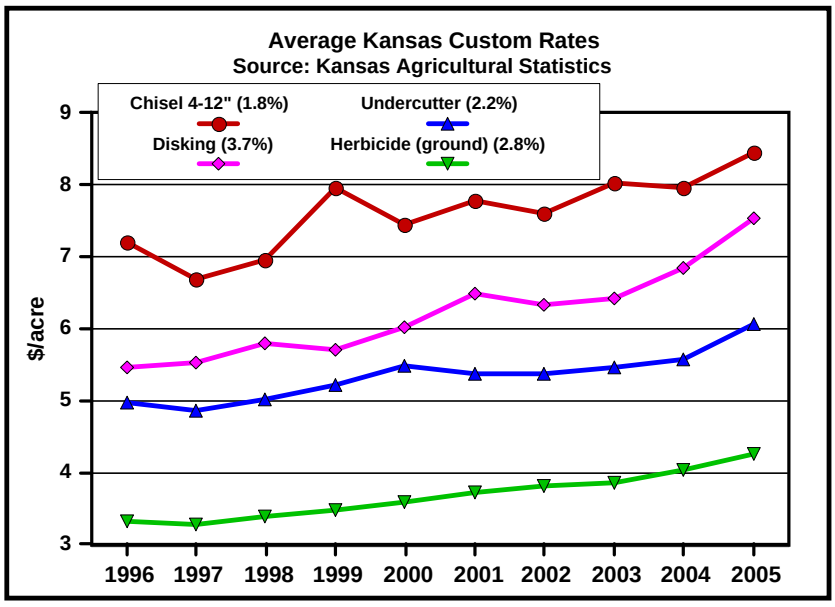
Effect of no-till on costs

- **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.**

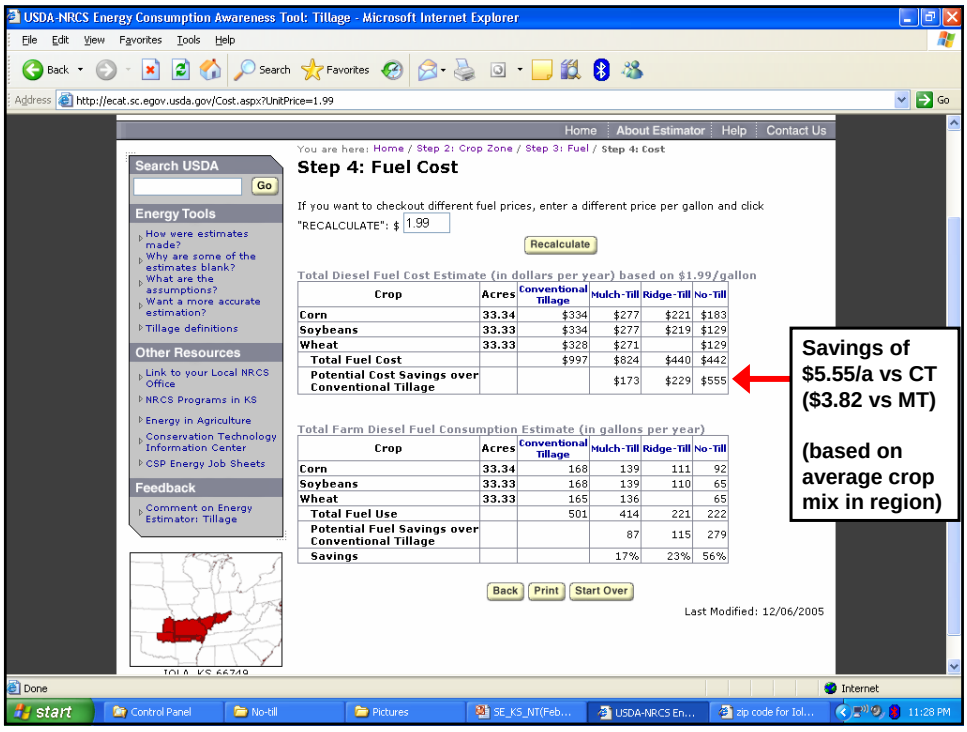
Diesel prices are forecasted to be below 2005 peak level, but they are still at historically high levels …



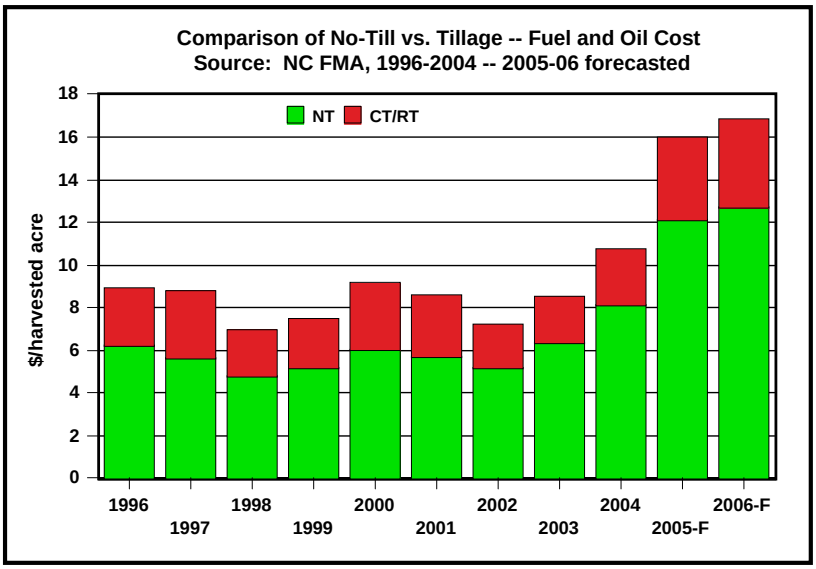
Based on 2/16/06 futures closing prices



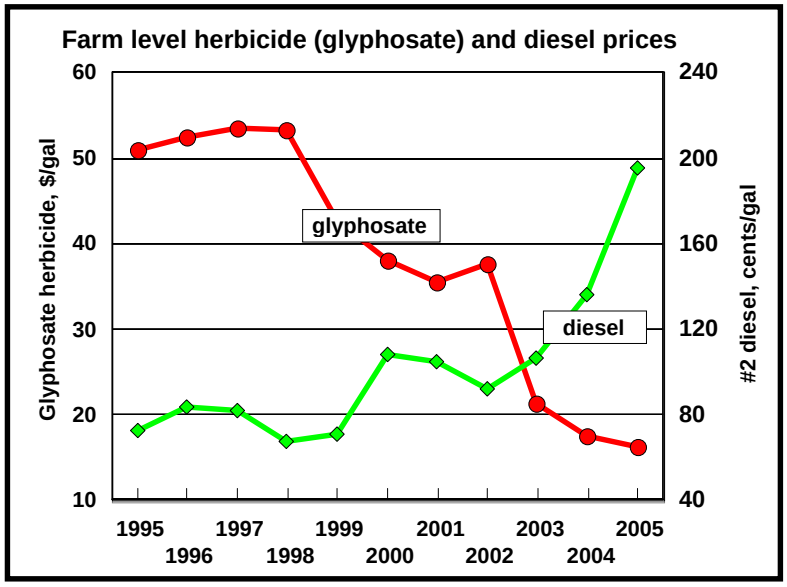
Impact of reducing tillage -- http://ecat.sc.egov.usda.gov/Default.aspx



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 ...

Revenue (yield x price)

- Cost (variable and fixed)

Profit or net returns

Western Kansas – higher yields and higher costs

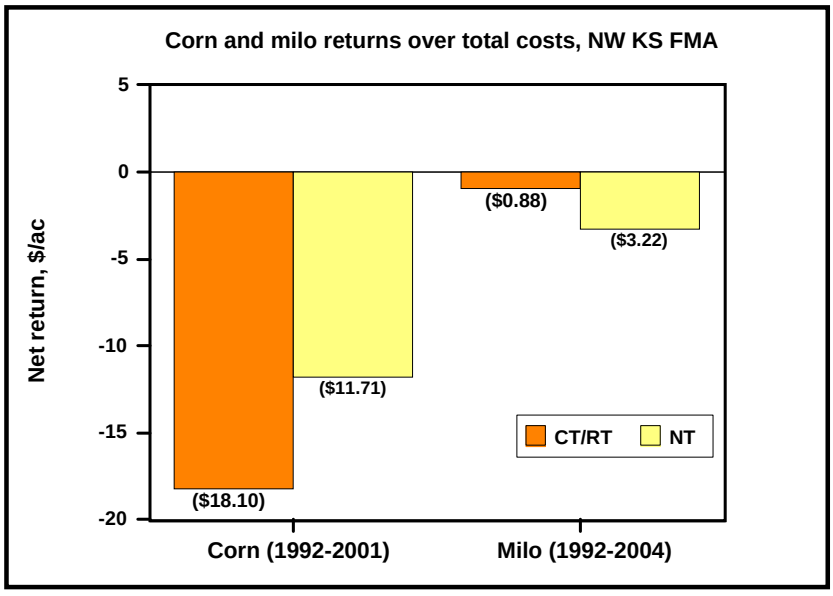
Central / eastern Kansas – similar yields & costs

Profitability complicating factors:

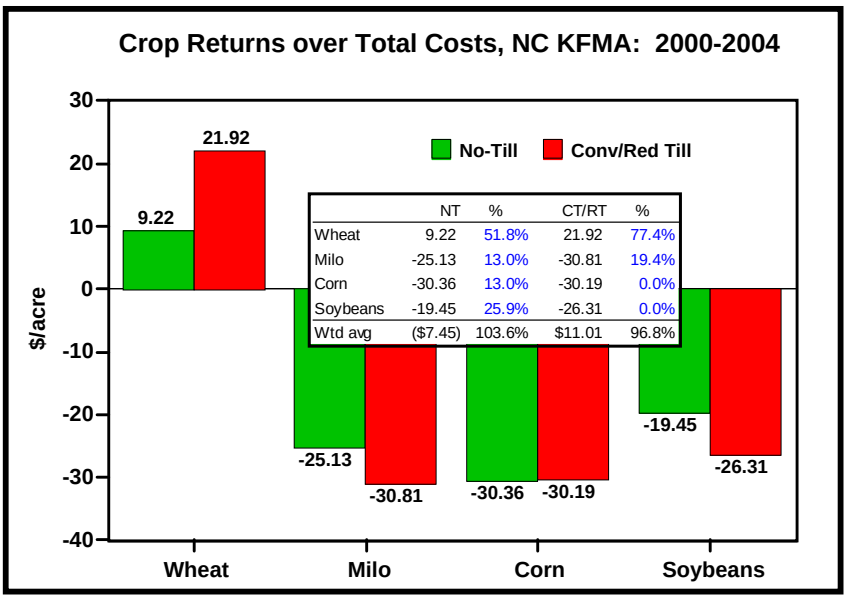
- **Cropping intensity**
- **Farm size**
- **Tillage x rotation interaction**

NT adoption is increasing, suggesting profitability

Actual farm-level data



Actual farm-level data



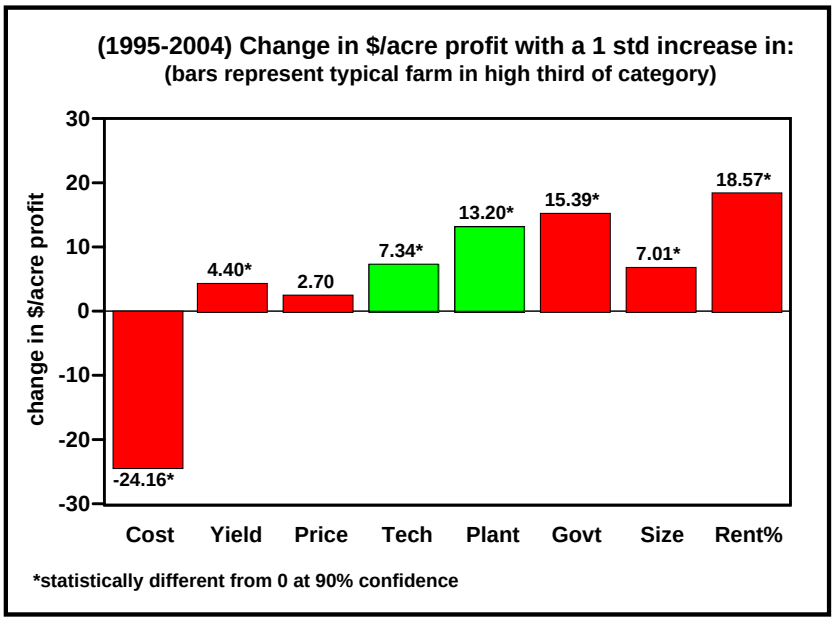
	NT	%	CT/RT	%
Wheat	9.22	51.8%	21.92	77.4%
Milo	-25.13	13.0%	-30.81	19.4%
Corn	-30.36	13.0%	-30.19	0.0%
Soybeans	-19.45	25.9%	-26.31	0.0%
Wtd avg	($7.45)	103.6%	$11.01	96.8%

Economic analysis using Kansas Farm Management data

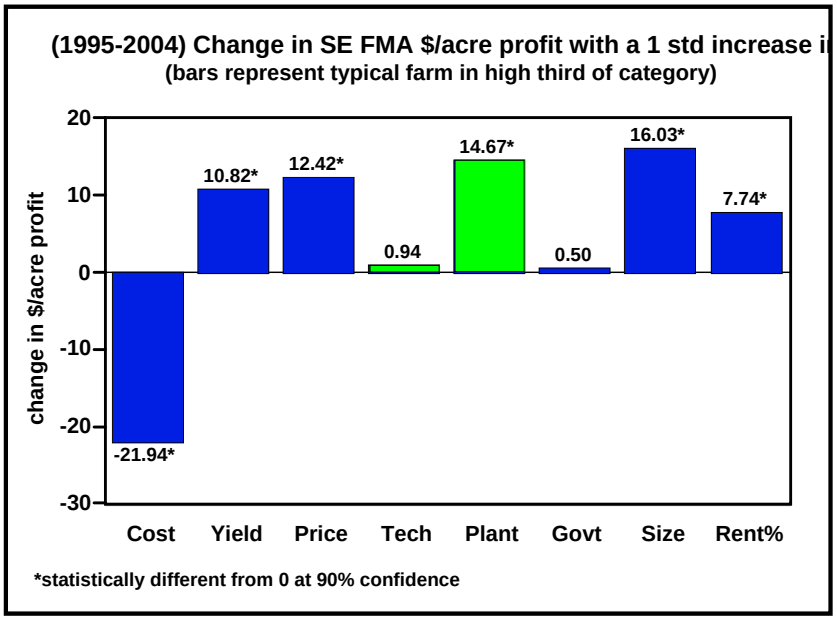
- **Which management factors impact profitability?**
- **10 years of data (1995-04)**
- **Approximately 900 farms**
- **Analysis focuses on crop producers**

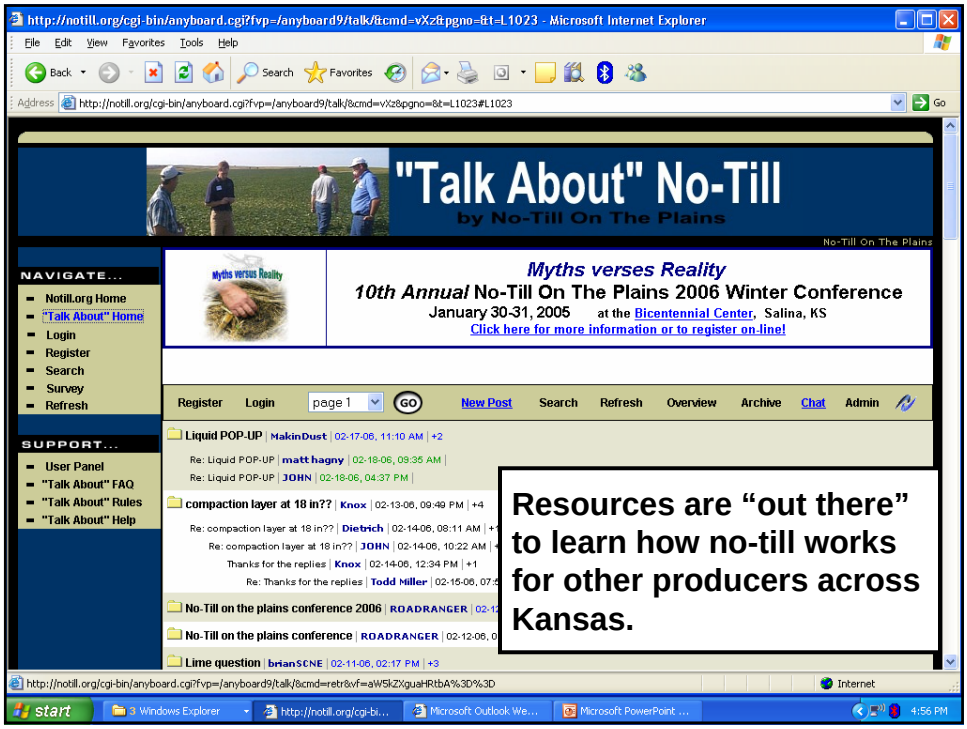
Kansas Farm Management Association
Helping You Put Knowledge To Work

Factors affecting profits (State KFMA) …



Factors affecting profits (SE KFMA) …





Questions ???

Kevin C. Dhuyvetter
785-532-3527
kcd@ksu.edu

Terry L. Kastens
785-532-5866
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