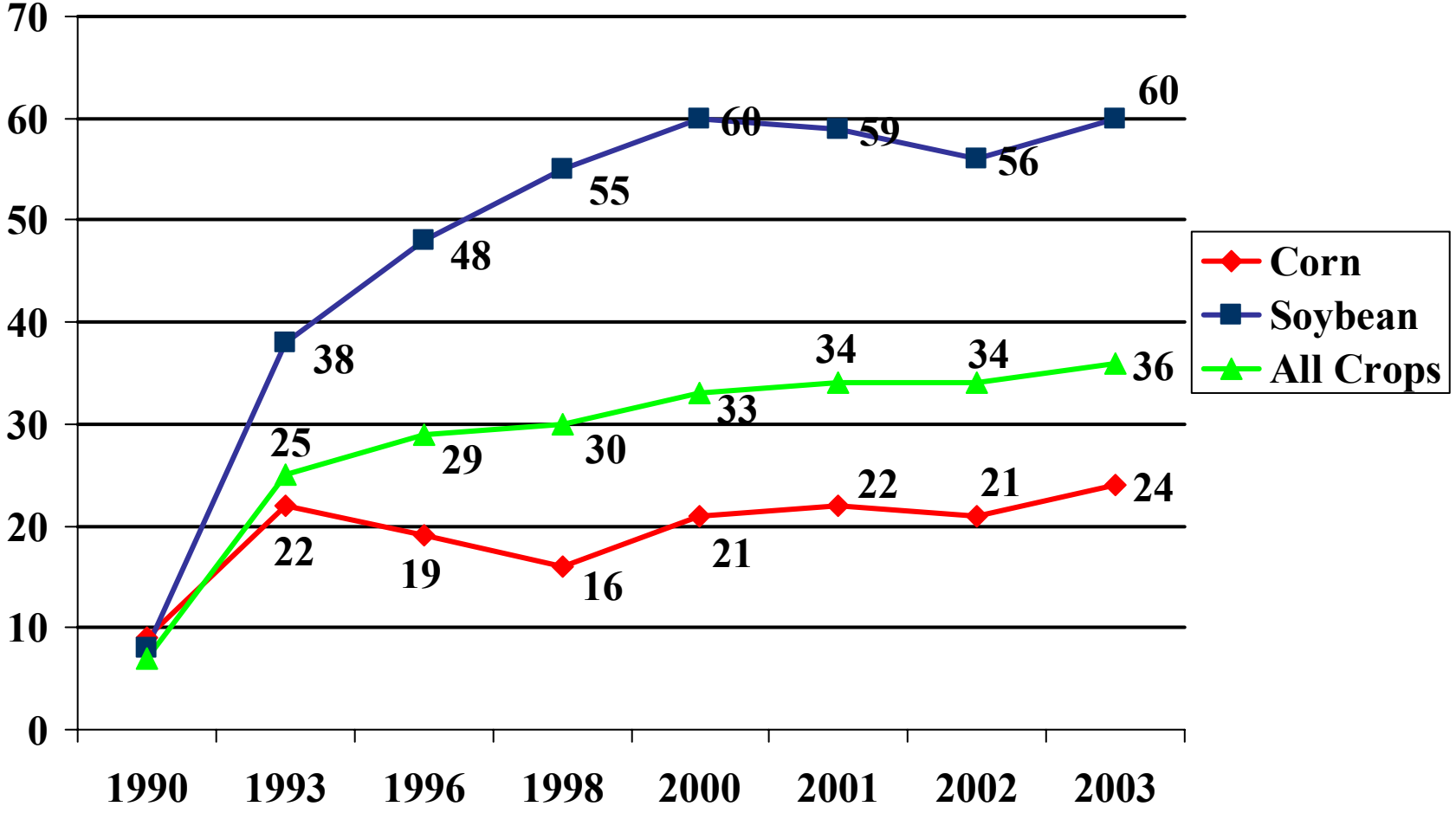
Strip-Till: A Closer Look

Tony J. Vyn,
with assistance from farmers, graduate students, technicians, and colleagues

PURDUE
UNIVERSITY

Indiana Tillage Data, 1990-2003

(percent of total cropland for specific crop in a no-till system)



Source: Purdue University-Transect Data

2002 Indiana Cropland Tillage Map

Percent of all Corn Fields planted using No-till

2002 Indiana Average is 21%

- < 20%
- 20–30%
- 30–40%
- 40–50%
- 50–60%
- > 60%
- No data available

Source: Purdue University-Transect Data

So What is Problem?

Planting Date?

Nutrient Availability?

Pests?

Yields?

Maturity?

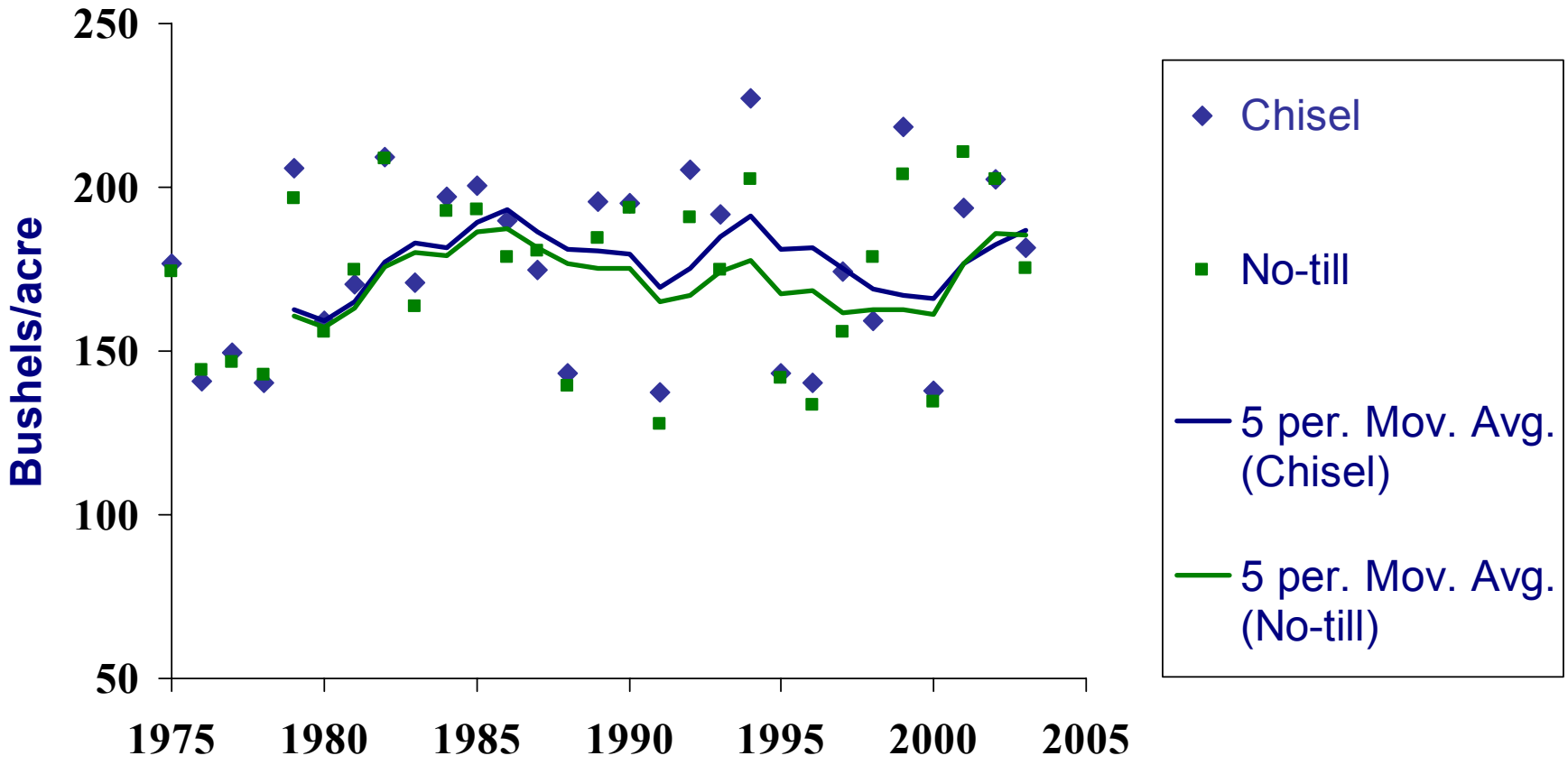
Poor Stand Establishment?

Corn Response to Tillage and Rotation

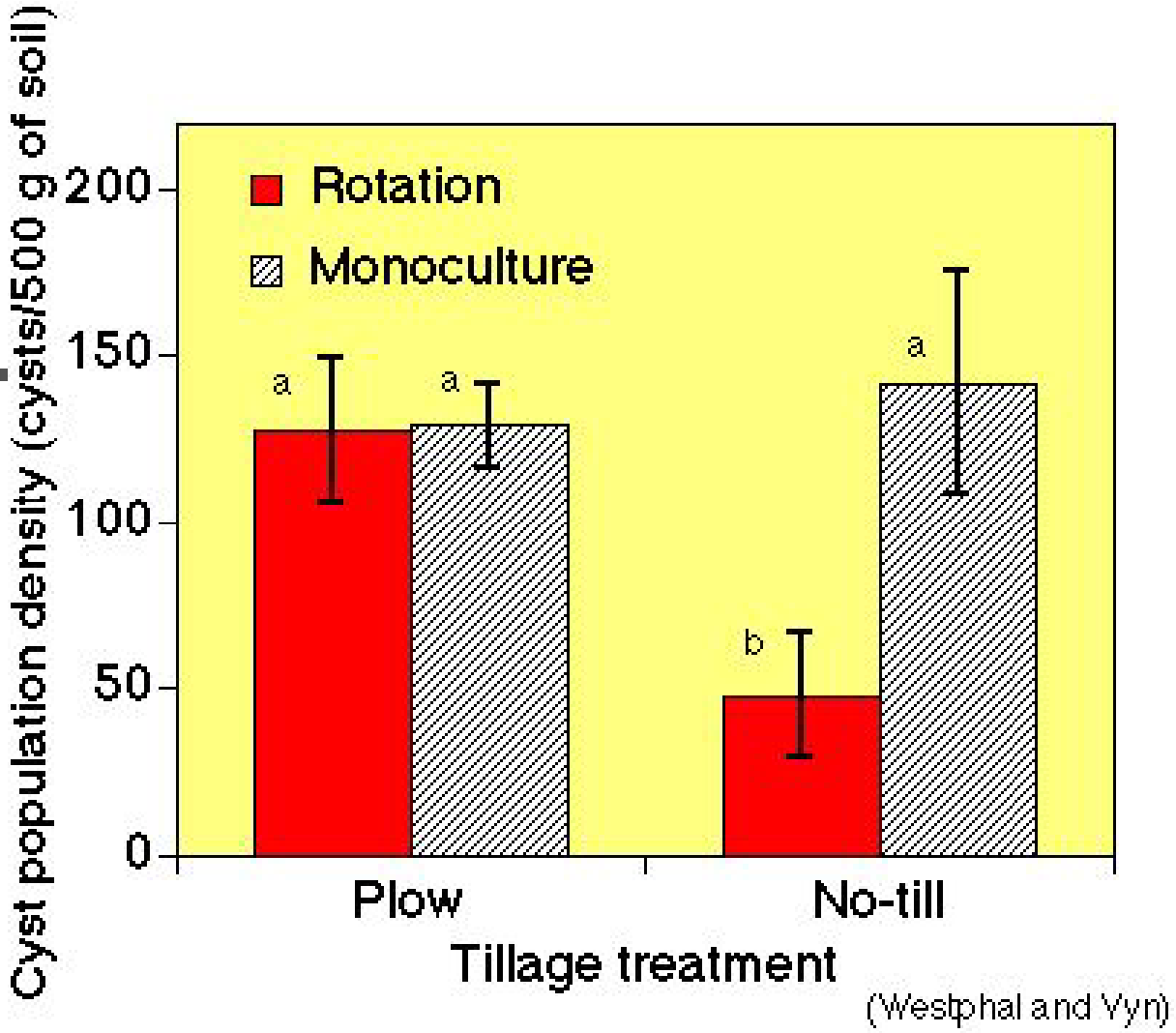
West Lafayette, IN, (1975-2003)

Tillage	Corn/Soybean		Continuous Corn		Yield Gain for Rotation
	Bu/ac	% of plow yield	Bu/ac	% of plow yield	%
Plow	176	- - -	169	- - -	5
Chisel	177	100	164	97	8
Ridge*	182	103	167	99	9
No-till	173	98	146	87	18

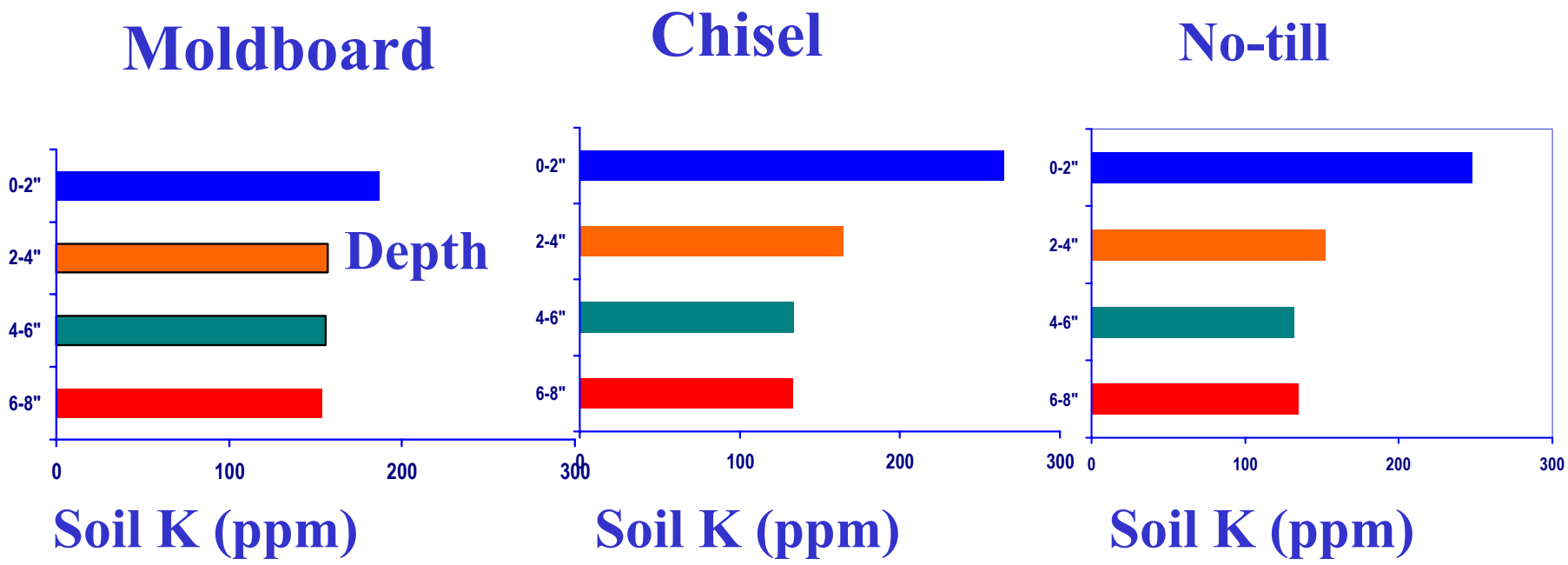
Corn Yields Following Soybeans, Chisel Vs. No-till, West Lafayette, IN, 1975-2003.



Population densities of Soy. Cyst Nematode under different crop sequences and tillage



Potassium Stratification
Long-Term Tillage (IN, 1975-94)

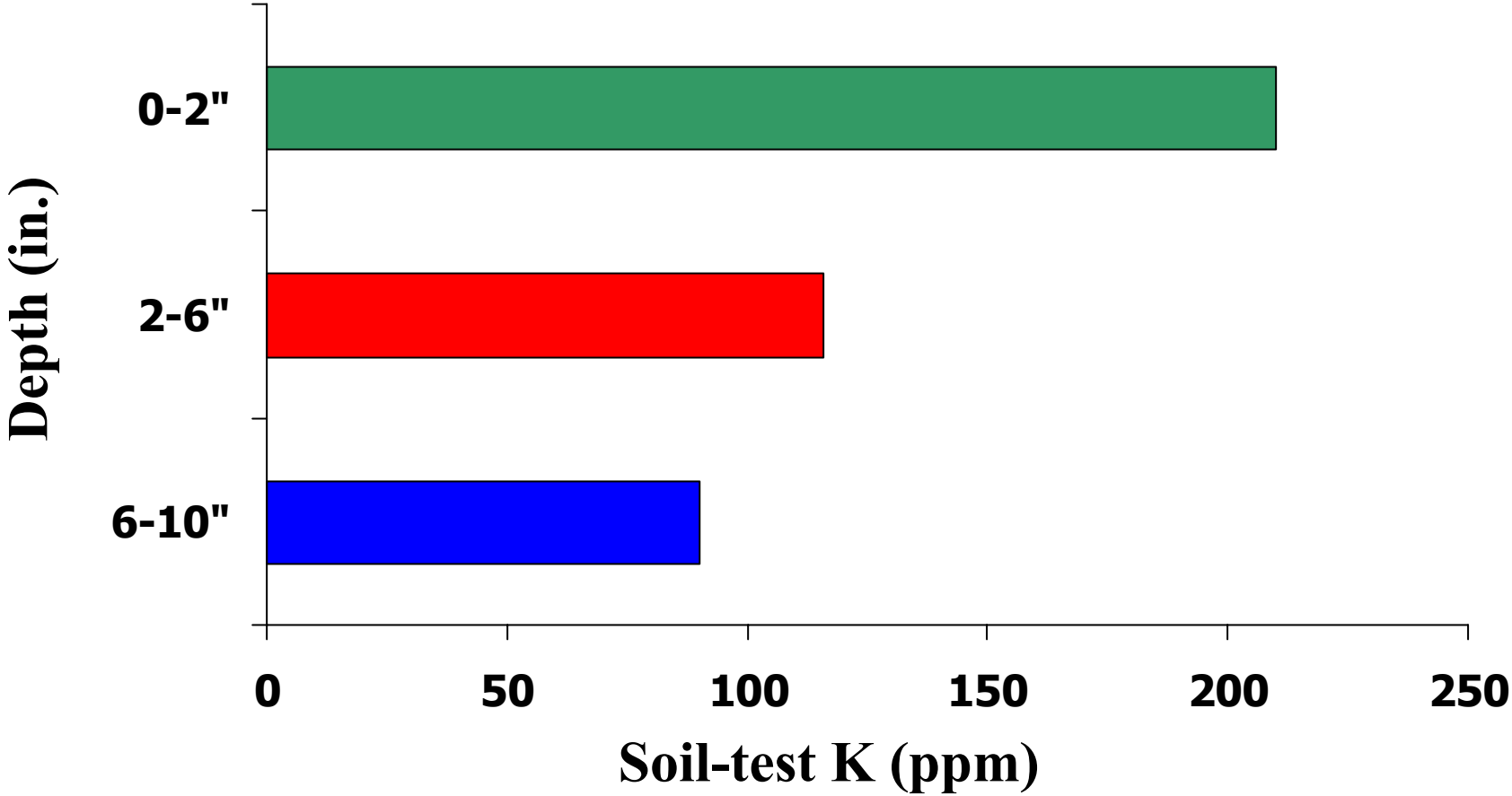


Source: Holanda et al. (1998)

Conservation Tillage Doesn't Alter K distribution appreciably

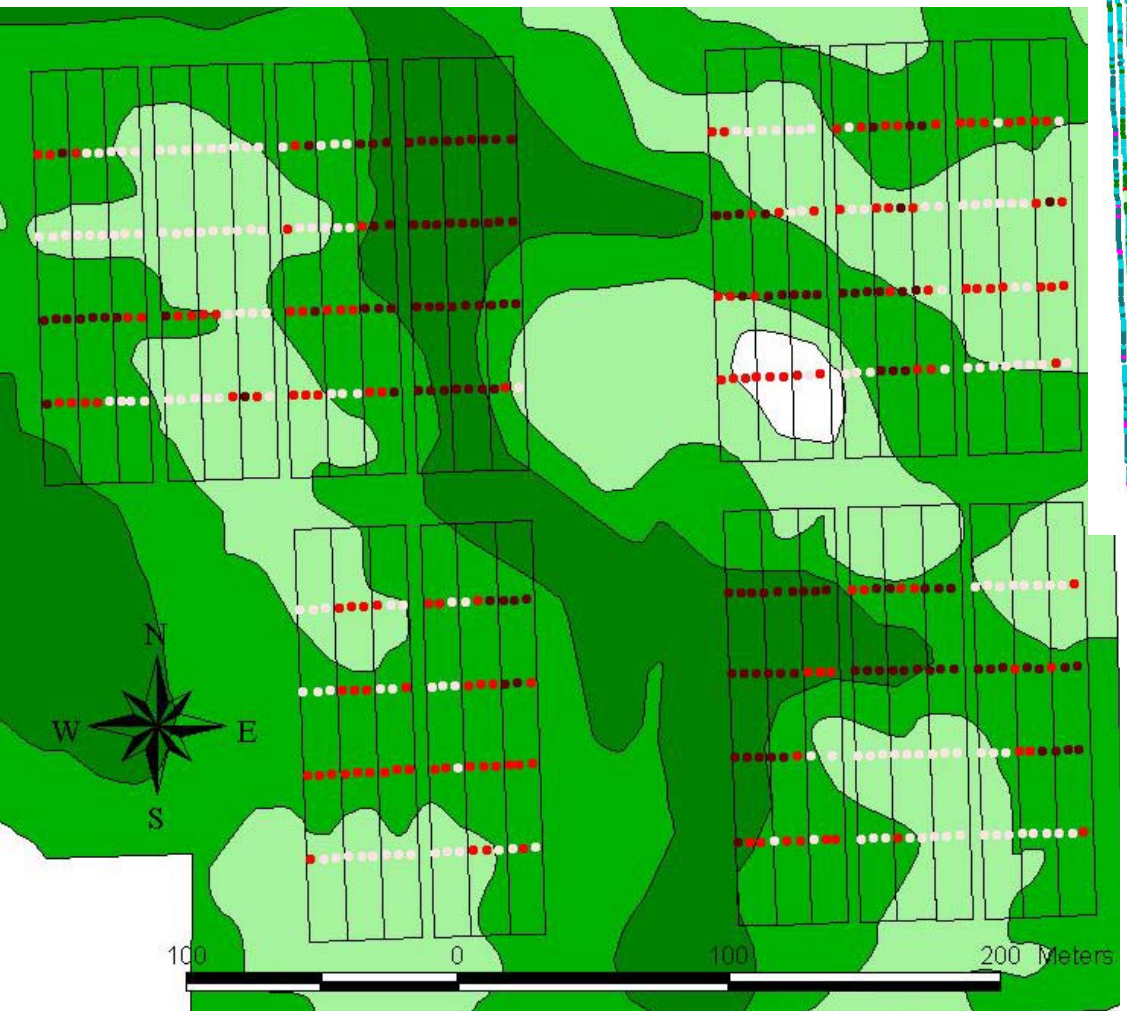
Planter Setup and Nutrient Banding?

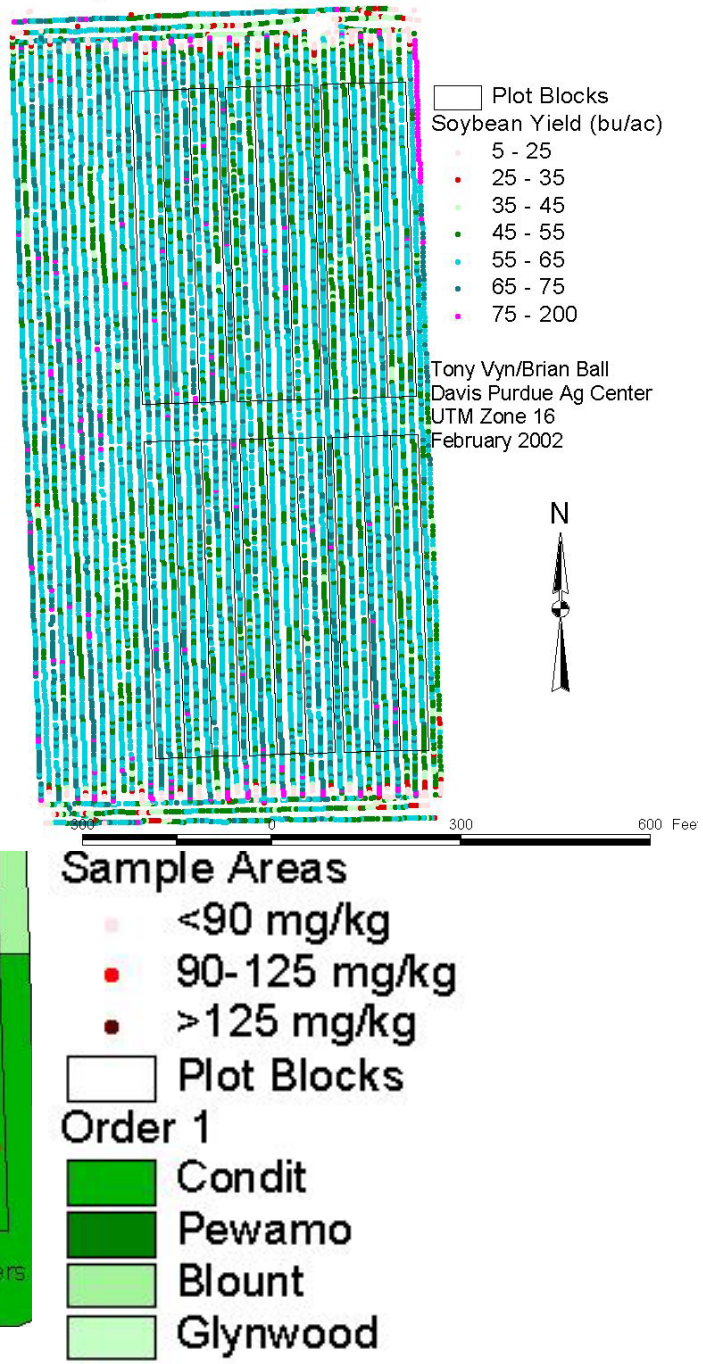
Mean Soil-test K Stratification at Davis, EC Indiana



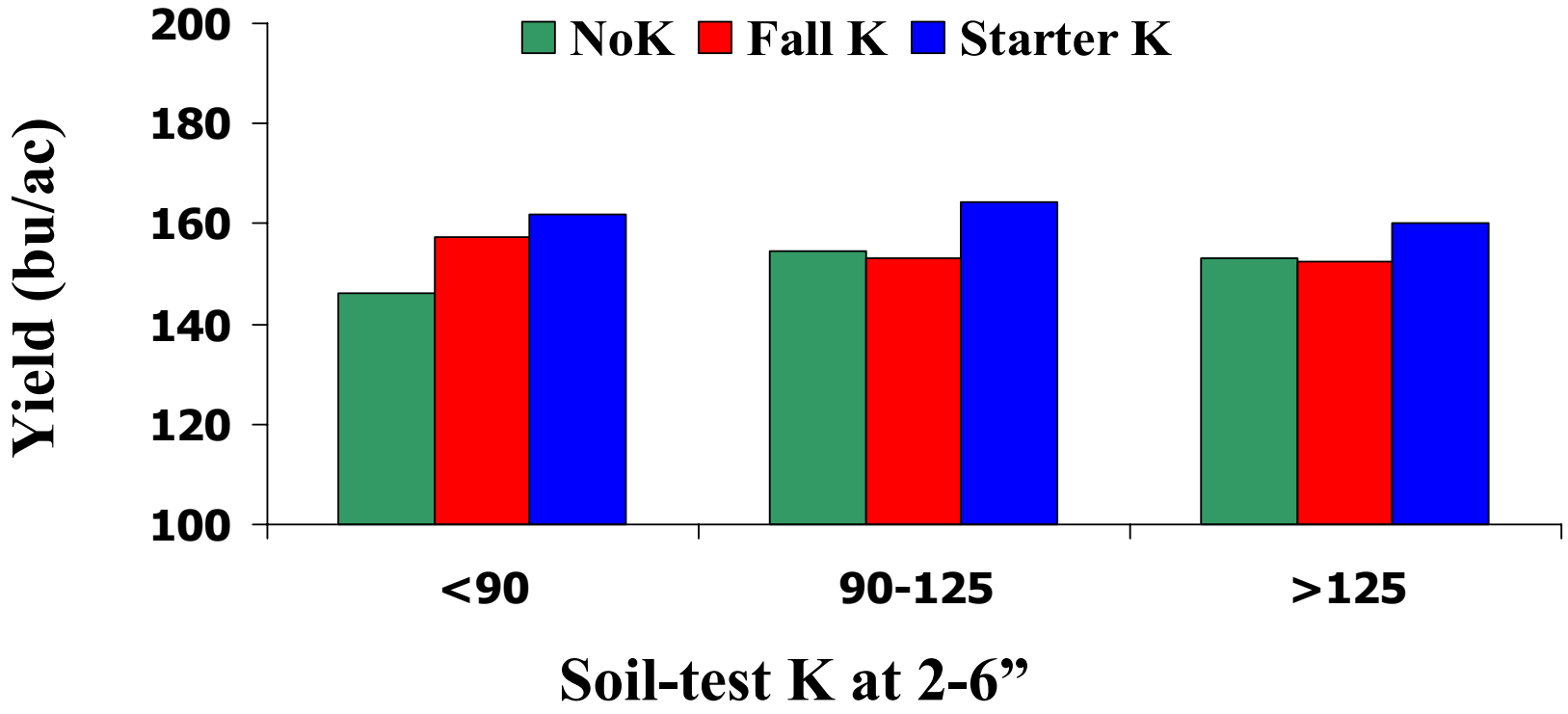
Source: Vyn et al., Better Crops #4, 2002

Soil K variability



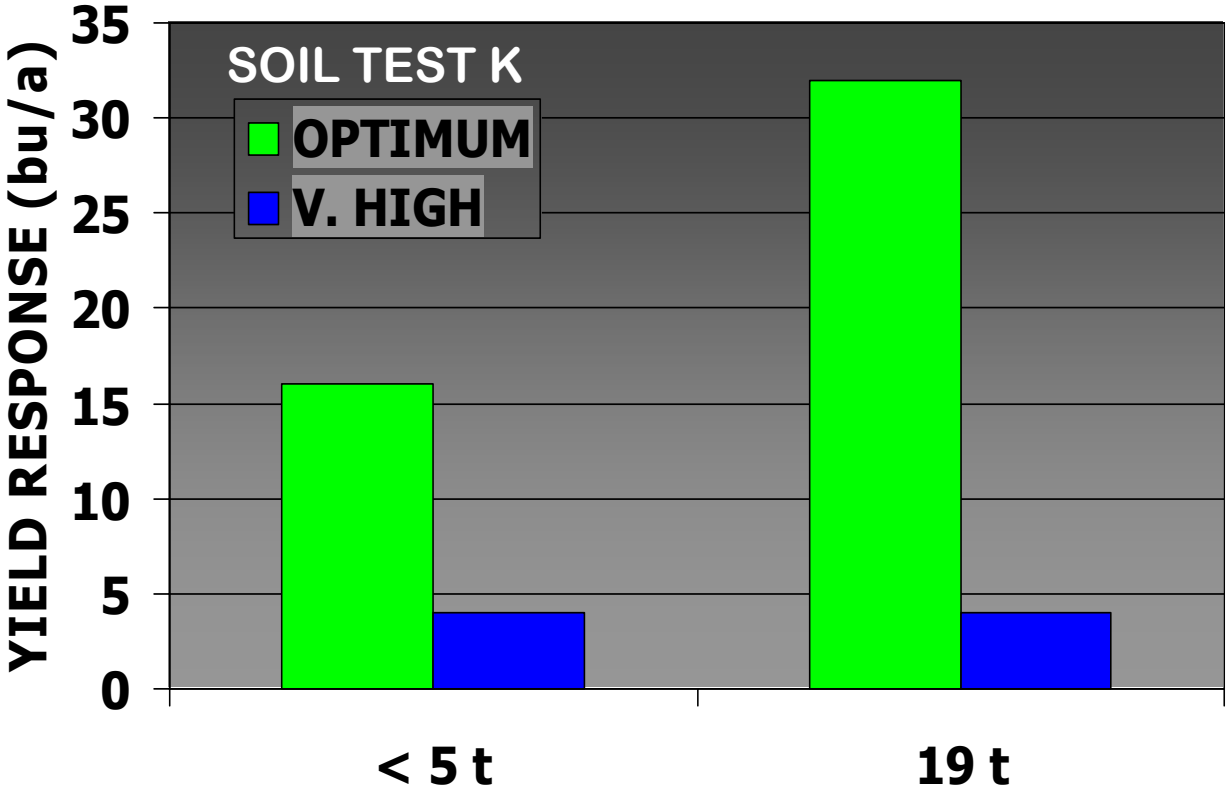


High oil corn yields in response to K placement (EC Indiana, 2000-01)



Source: Vyn et al., Better Crops #4, 2002

RESPONSE OF CORN TO ROW-APPLIED K ON A SILTY CLAY LOAM SOIL (3 yr. avg.)



Dr. Wolkowski, UW, Oshkosh, Wis. (45 lb $K_2$0/a)

Going Deeper??

Strip Tillage for Corn

Fall Strip-till Option?

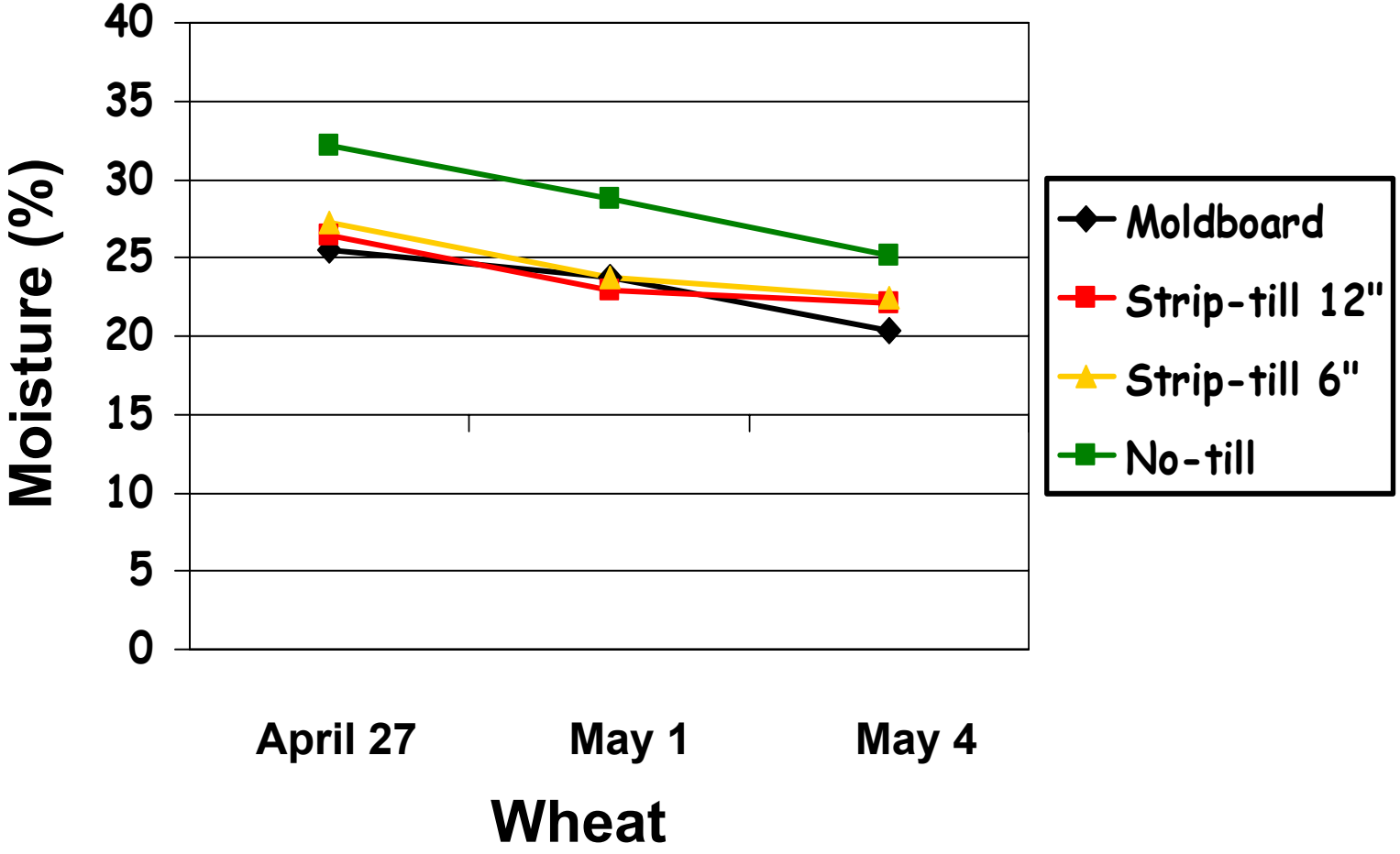
Strip Tillage with Fertilizer Banding

What are we after?

- **Yields**
  (relative to no-till; stability)
- **Planting Timeliness**
  (pre-plant soil conditions)
- **Fertilizer Placement Efficiencies**
  (systems approach)


Spring

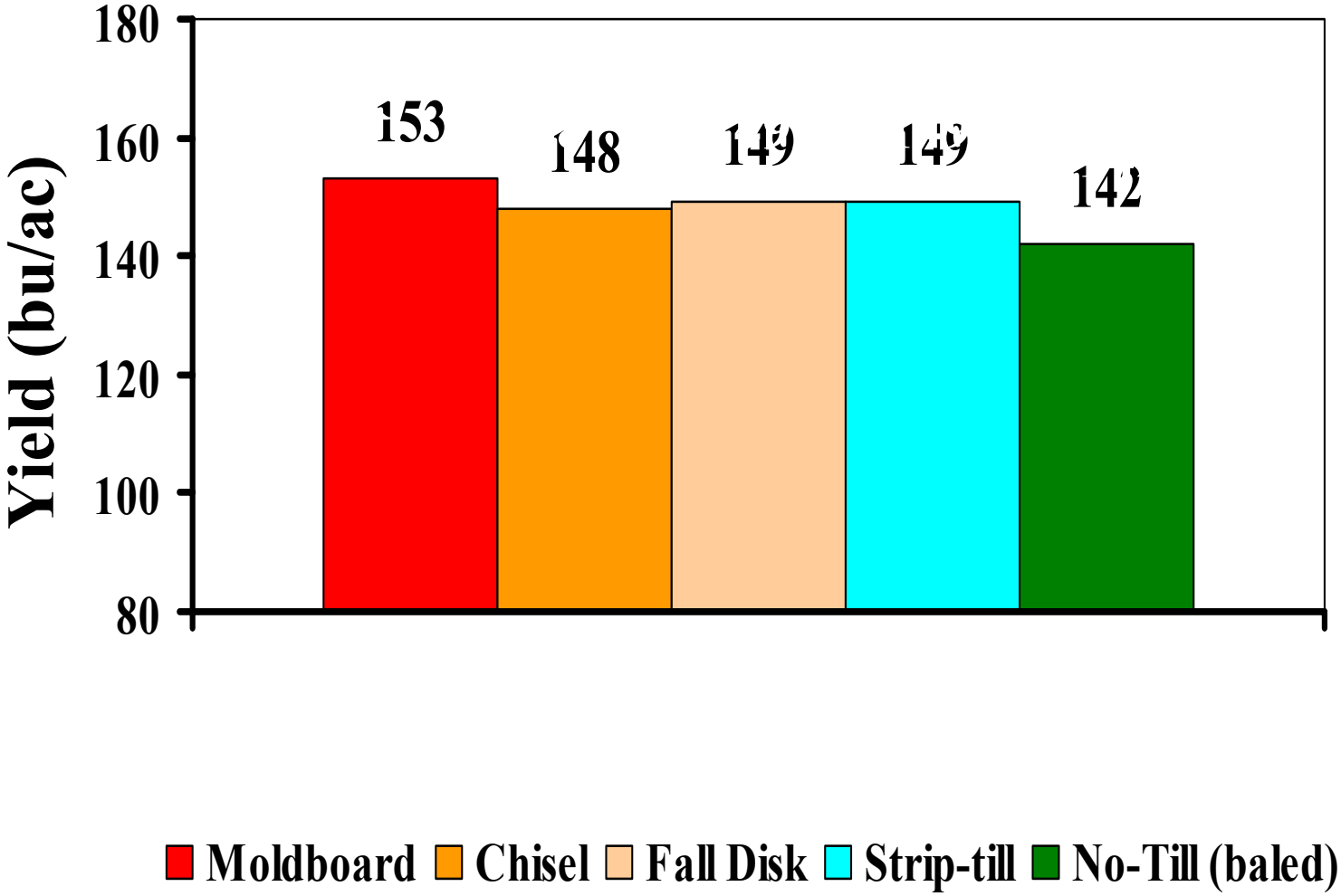
Soil Drying Pattern (0-6”) after Wheat (ON, 1999)



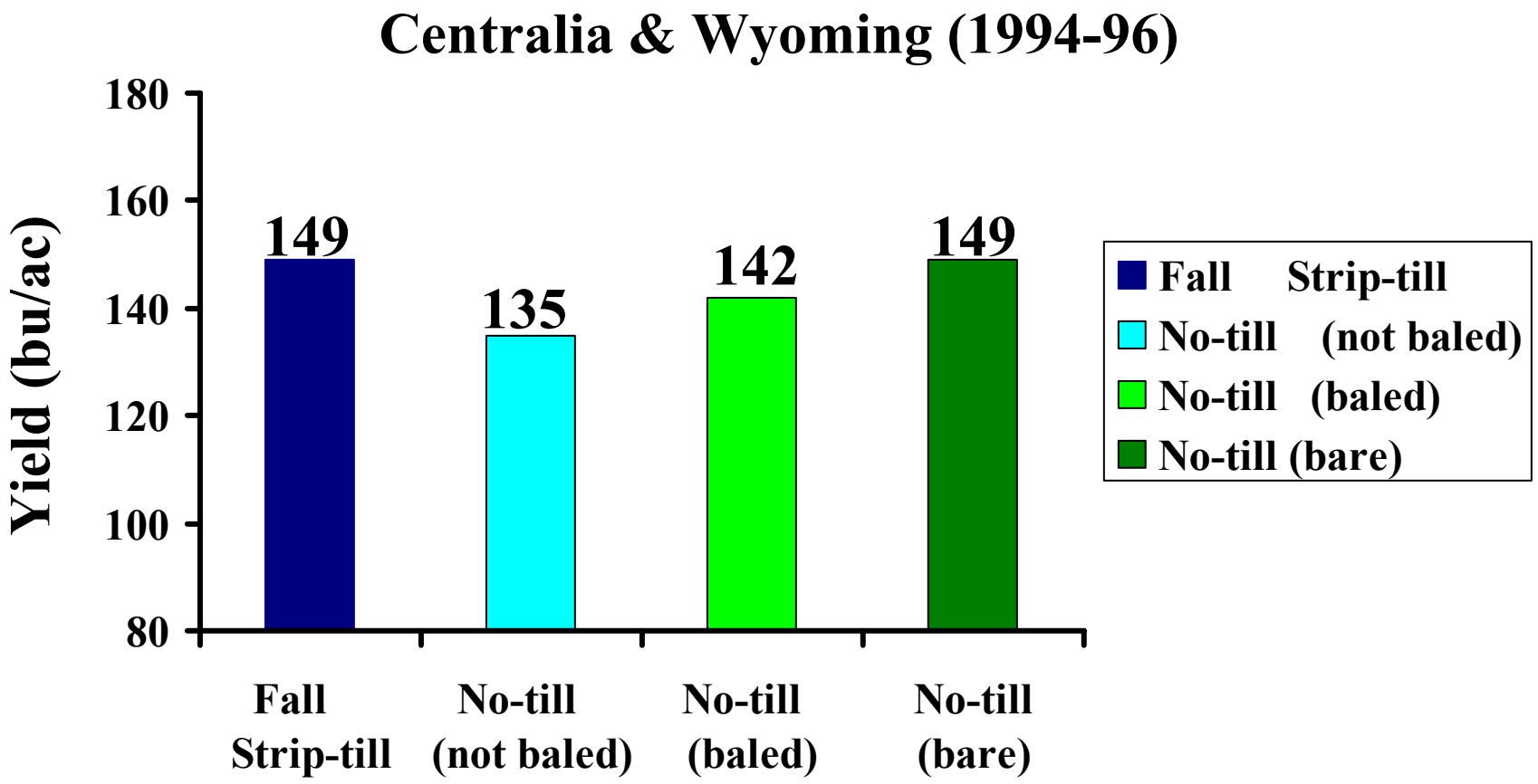
Strip-till versus No-till Corn after Wheat (Belmont, ON)

Tillage Effects on Corn Yield After Wheat

Centralia and Wyoming, ON (1994-96)



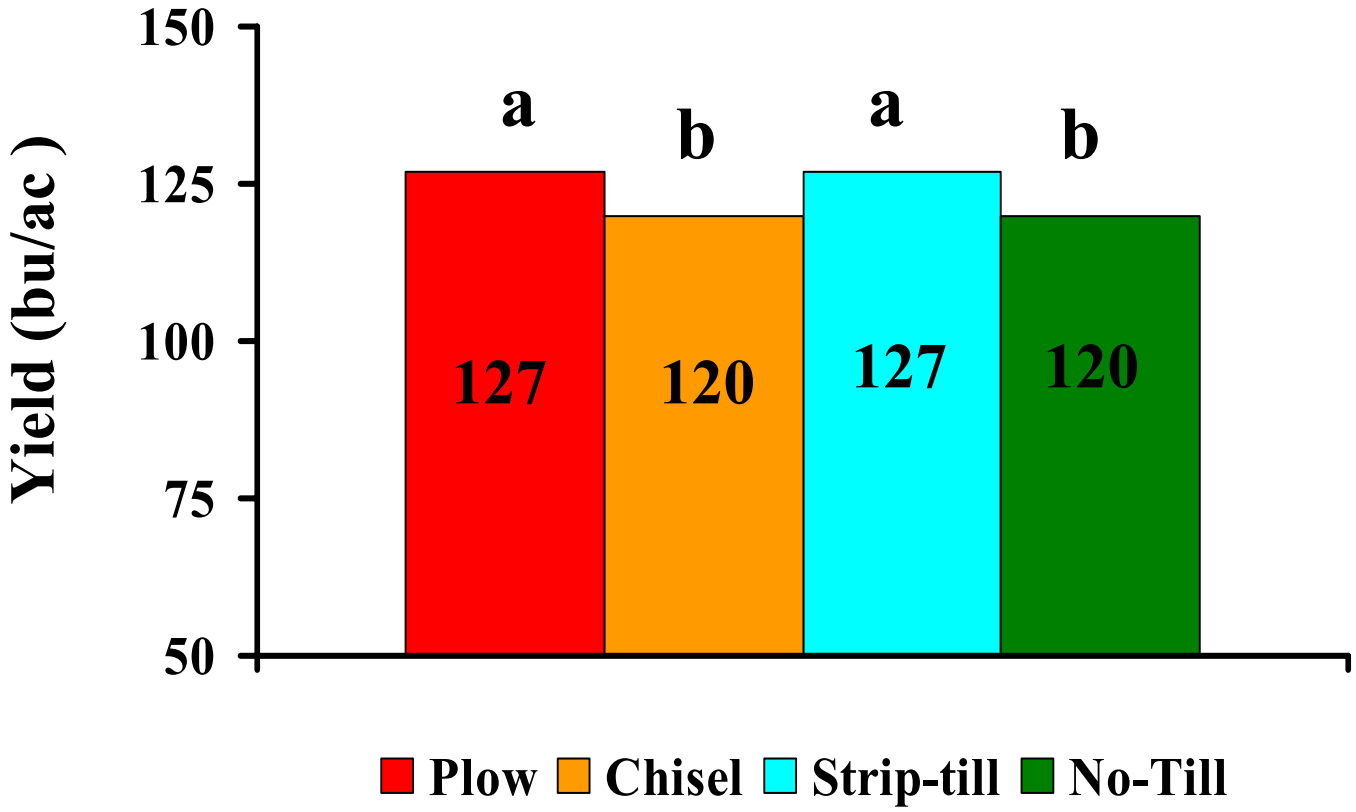
Wheat Residue Effect on No-till Corn Yields



Opoku, Vyn & Swanton (Agron. J. 89:549)

Tillage Effects on Corn Yields After Soybeans

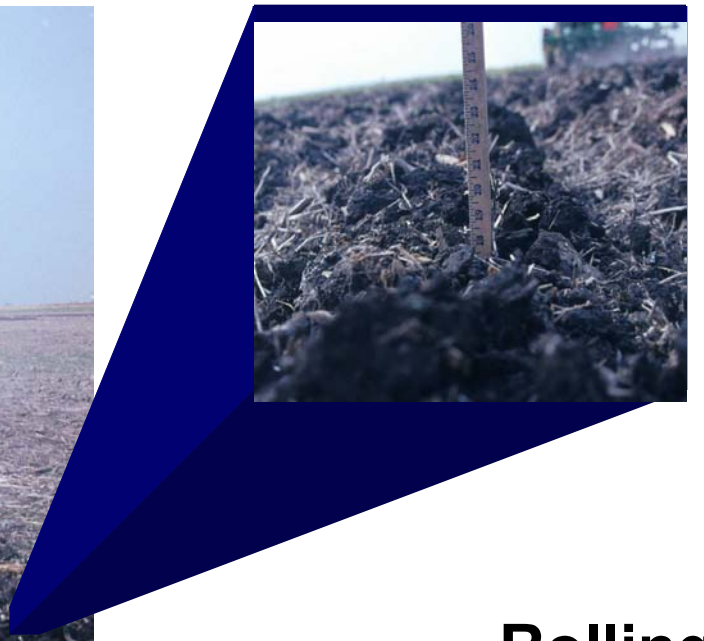
(Hooker, Avg. of Alvinston and Fingal, ON, 1994-96)



Fall Strip-till 8” depth

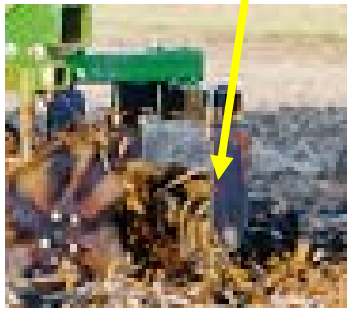
DMI 2500
with Mole Knife

Fall Strip-till 12-14” depth

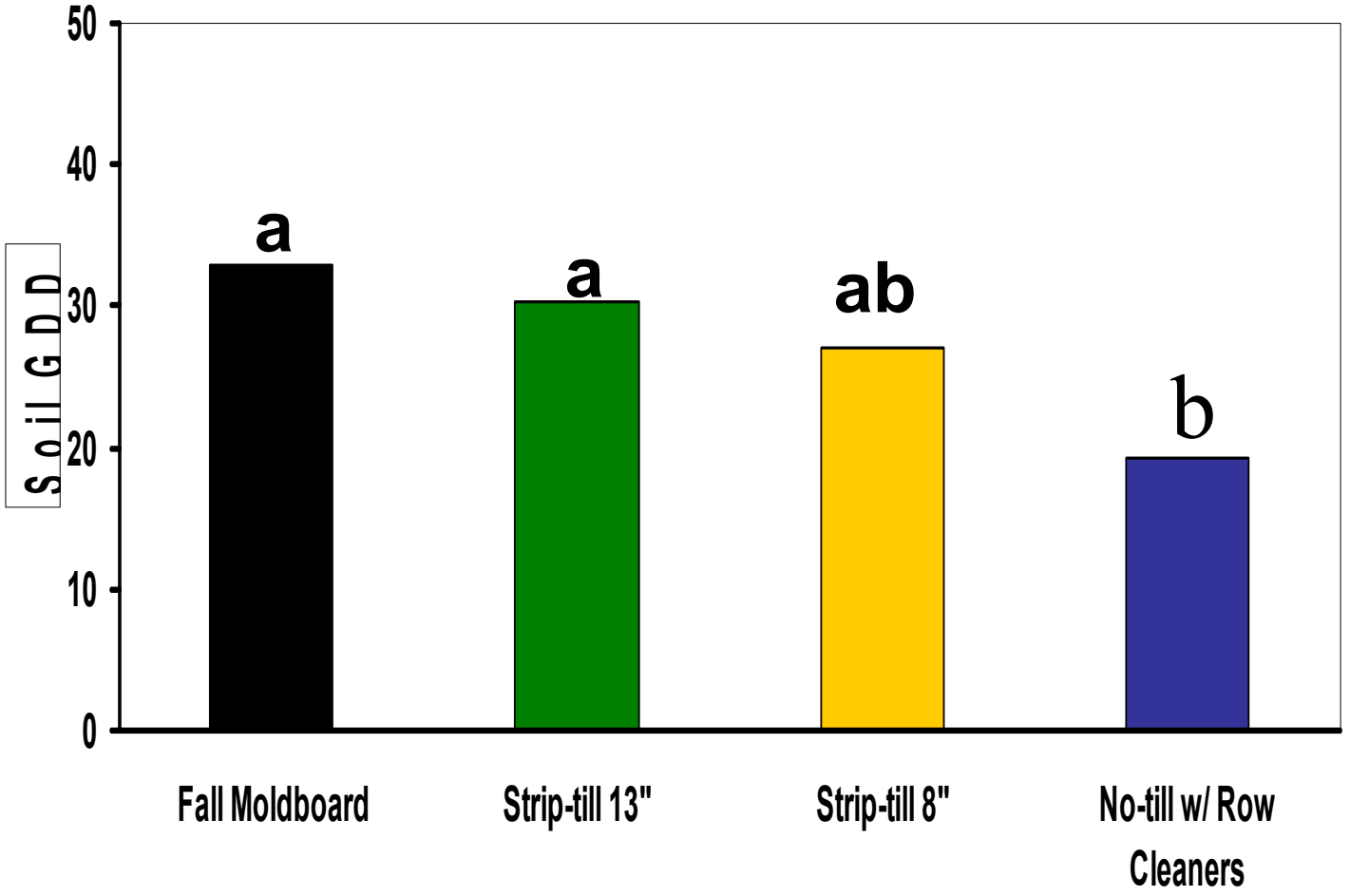


John Deere 955
Deep Ripper

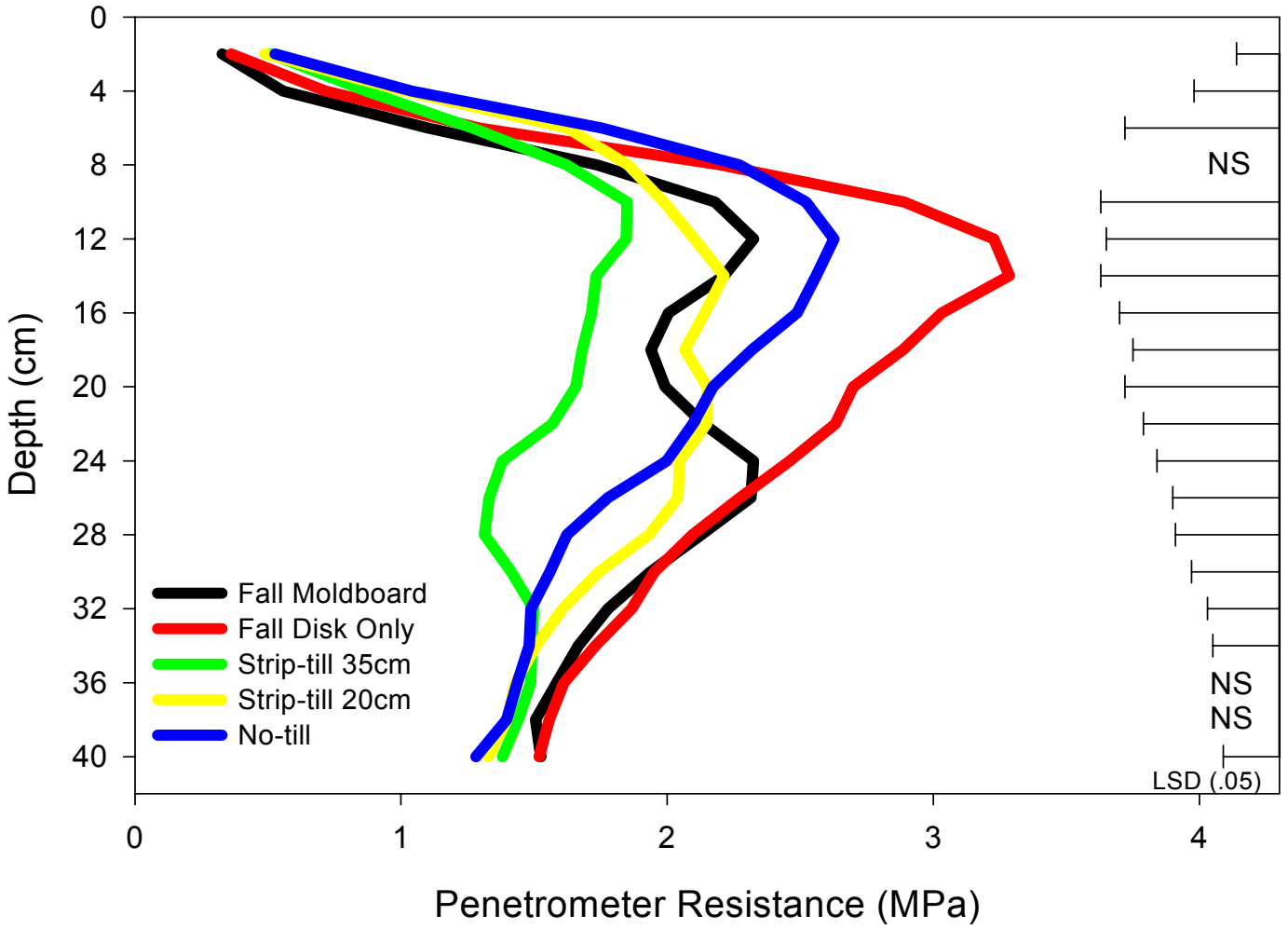
Rolling
Basket



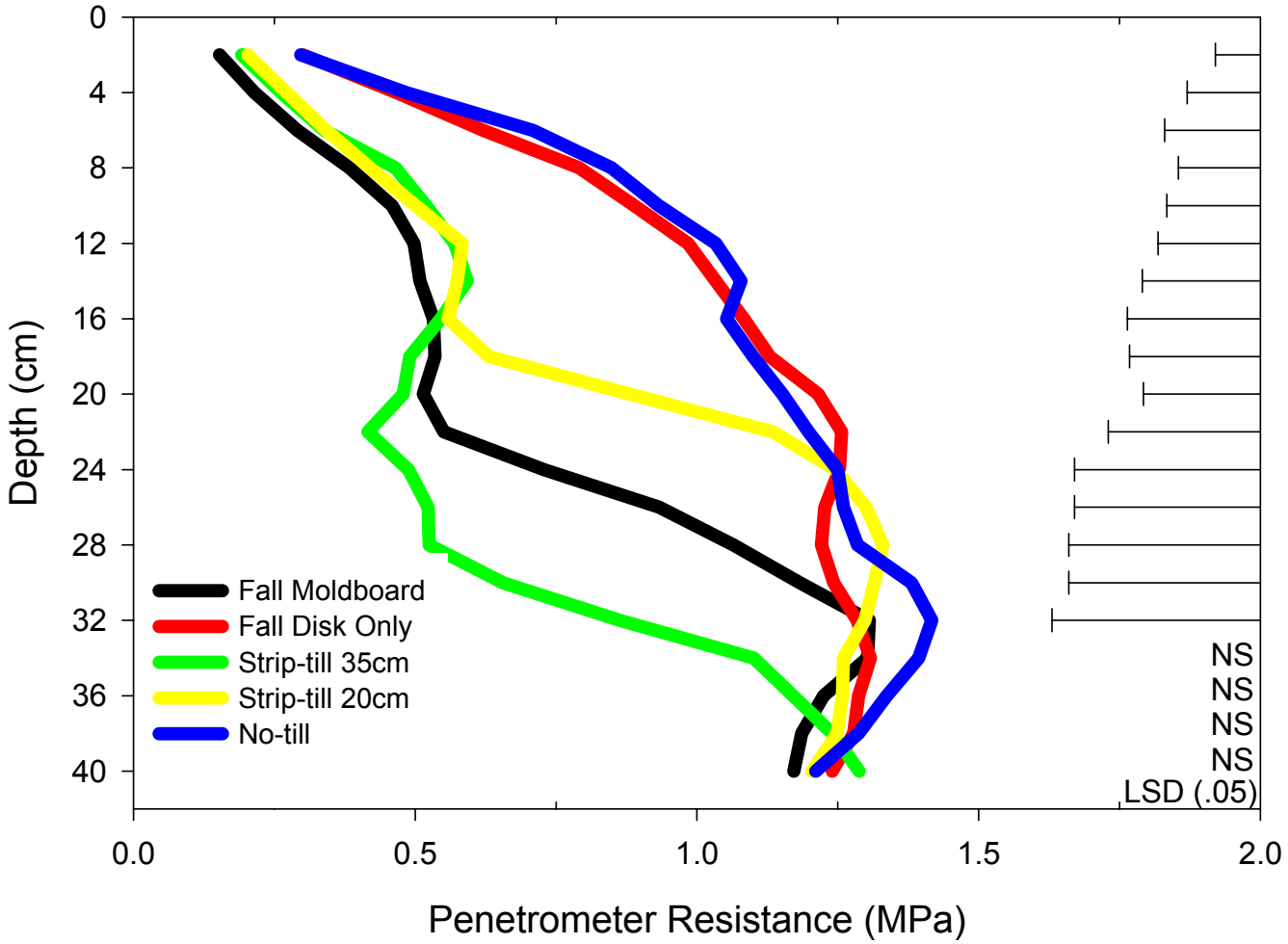
Accumulated Soil GDD Pre-Planting 1999-2001, IN



1999 Soil Penetrometer Resistance
Average Soil Moisture = 25%

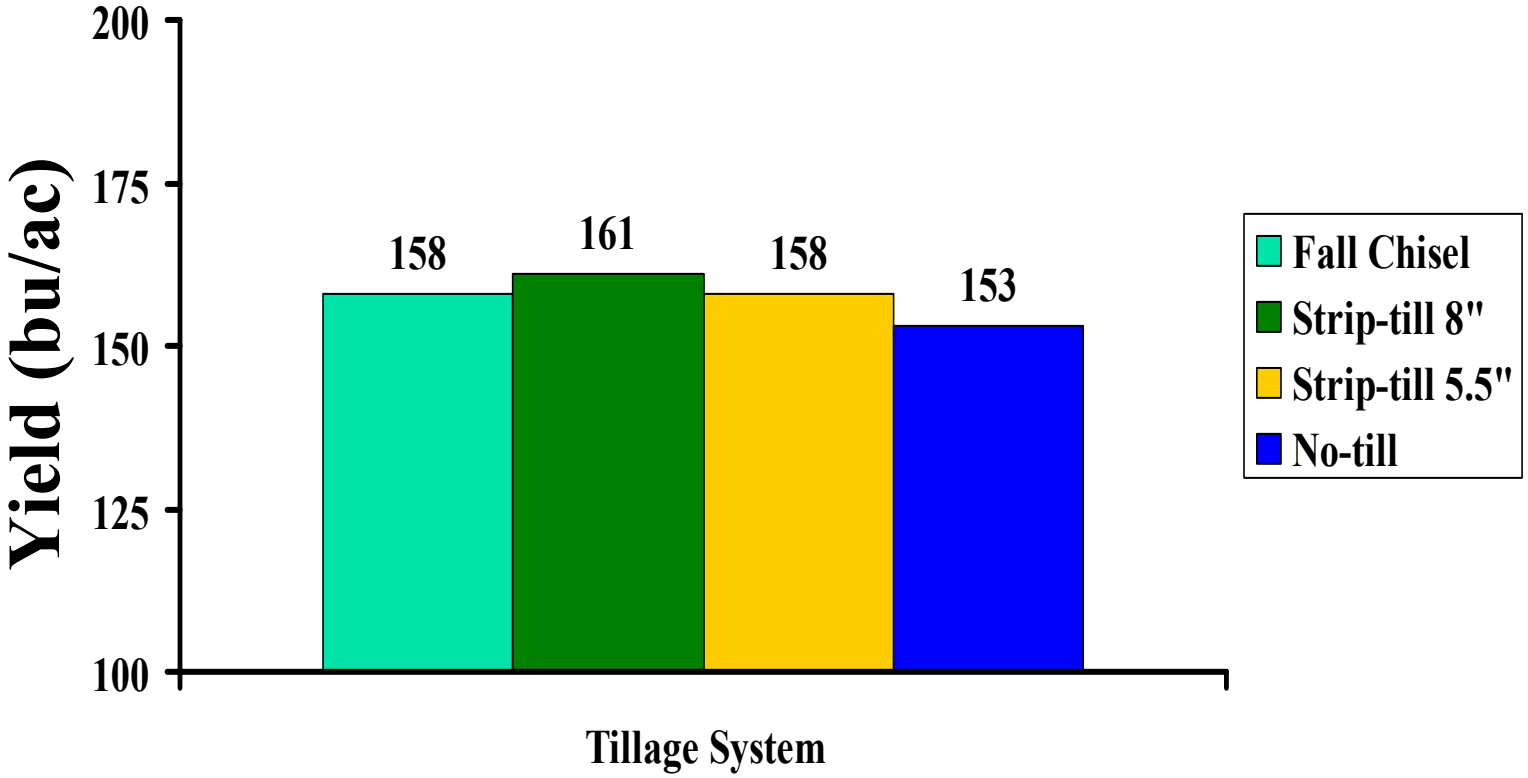


2000 Soil Penetrometer Resistance
Average Soil Moisture = 36%

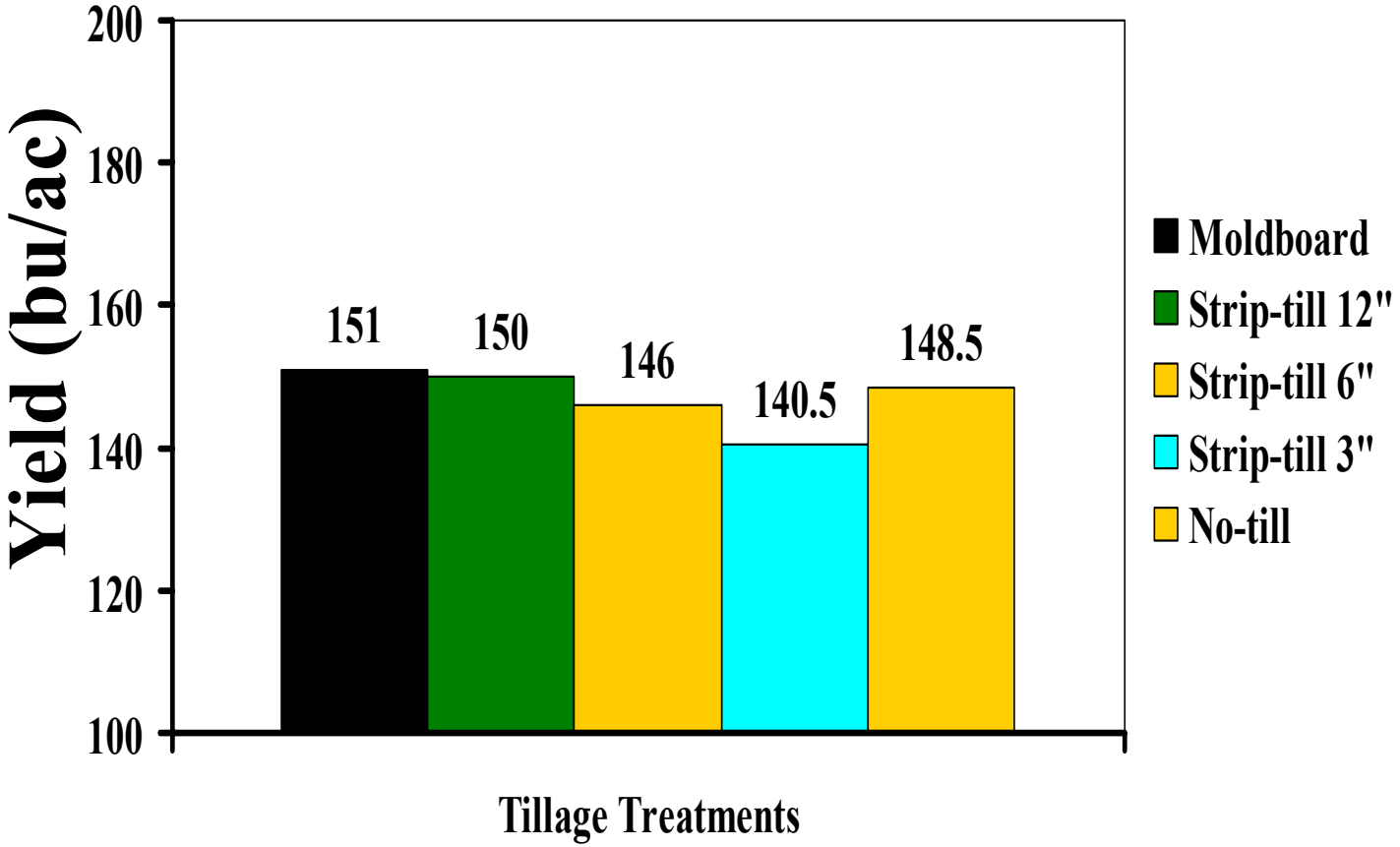


Lsmeans covariate from 8-20cm depth.

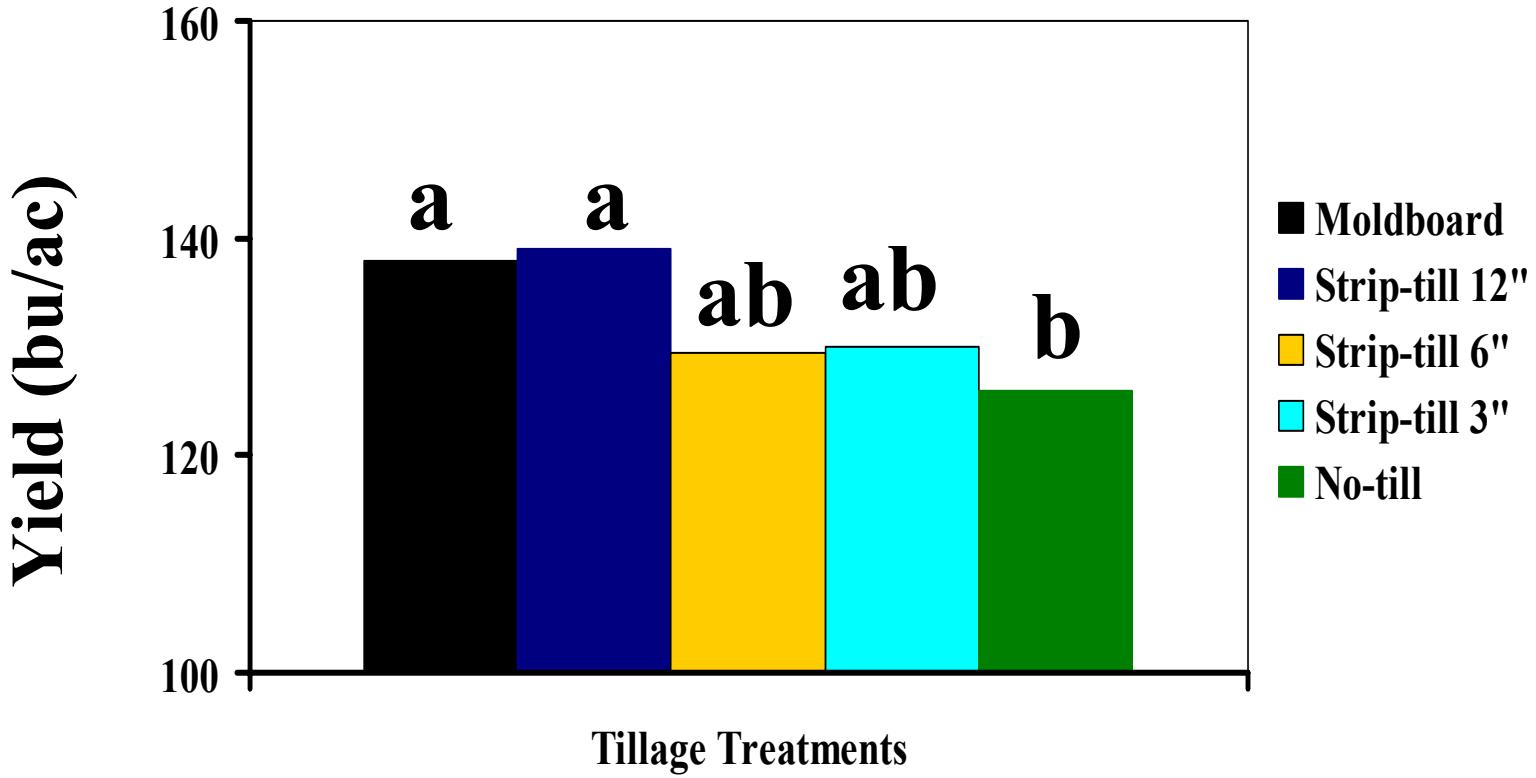
Depth of Strip-till and Corn Yields Sandy loam (IN, 2001)



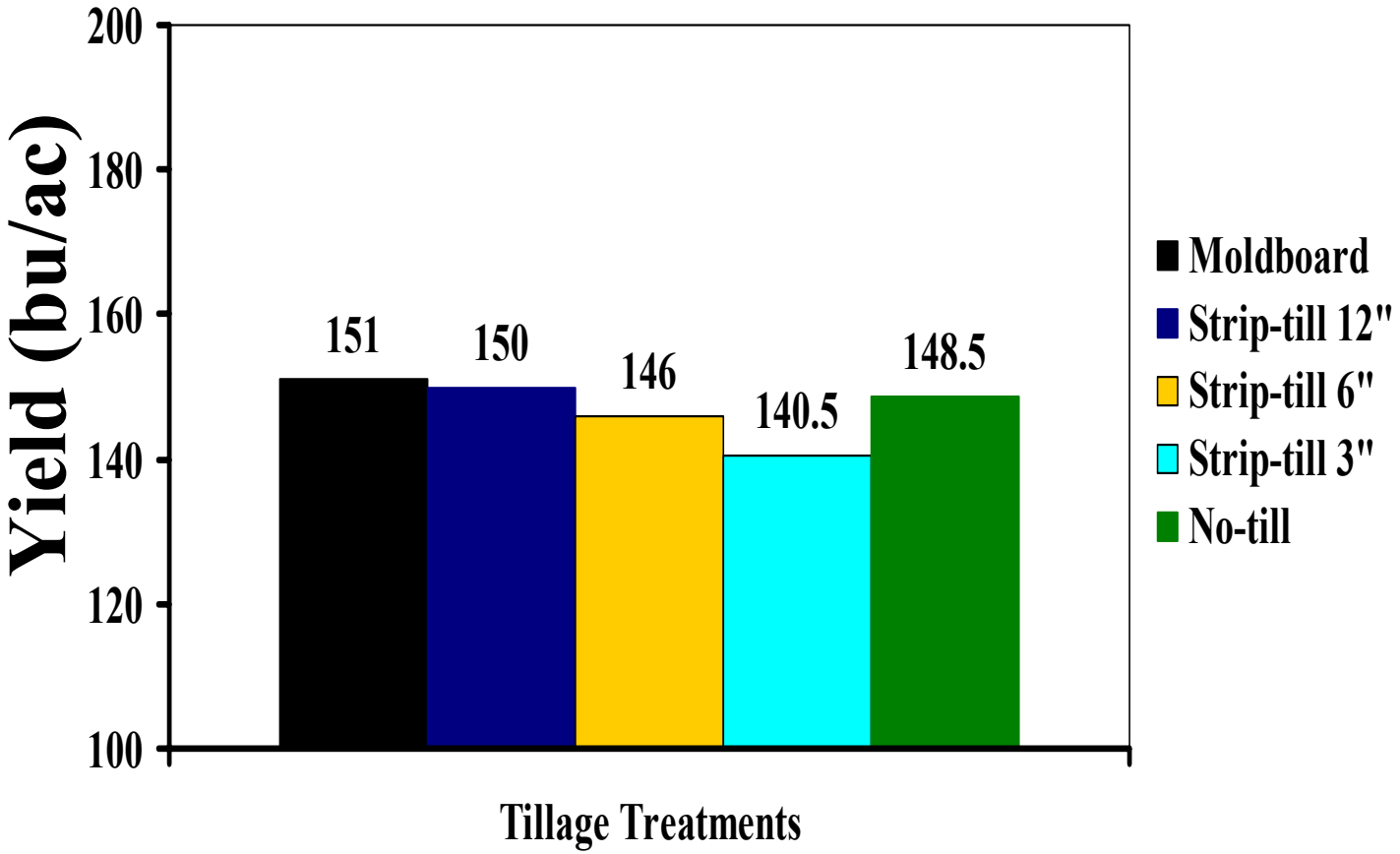
Fall tillage effects on corn yield after wheat (averaged over 98-00) in Ontario.



Fall tillage effects on corn yield after soybeans (averaged 1998-00) in Ontario.



Fall tillage effects on corn yield after wheat (averaged over 98-00) in Ontario.



Corn yields in Indiana following soybeans in Indiana (1999-2001)

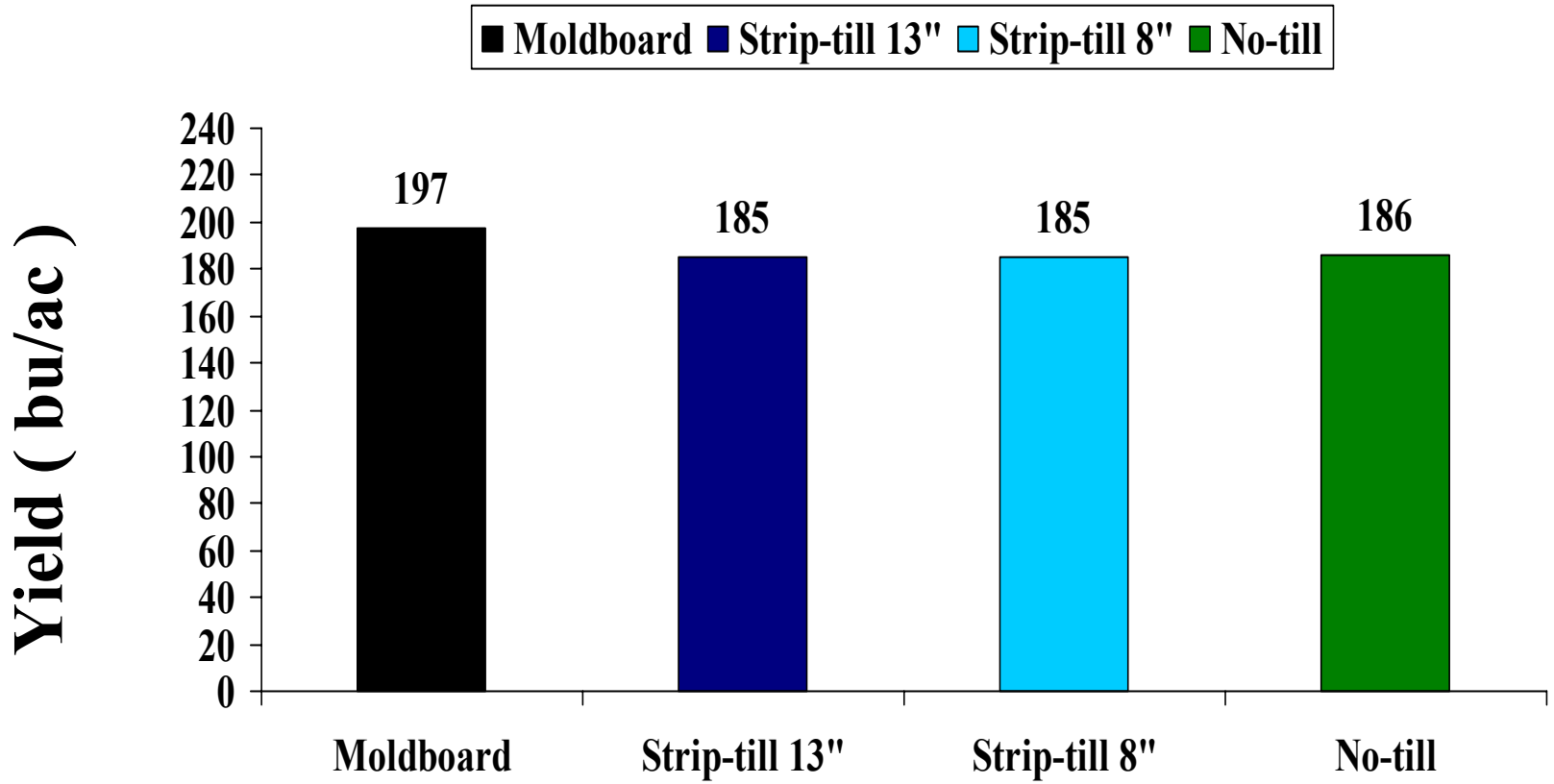



Photo Credit: Greg Stewart

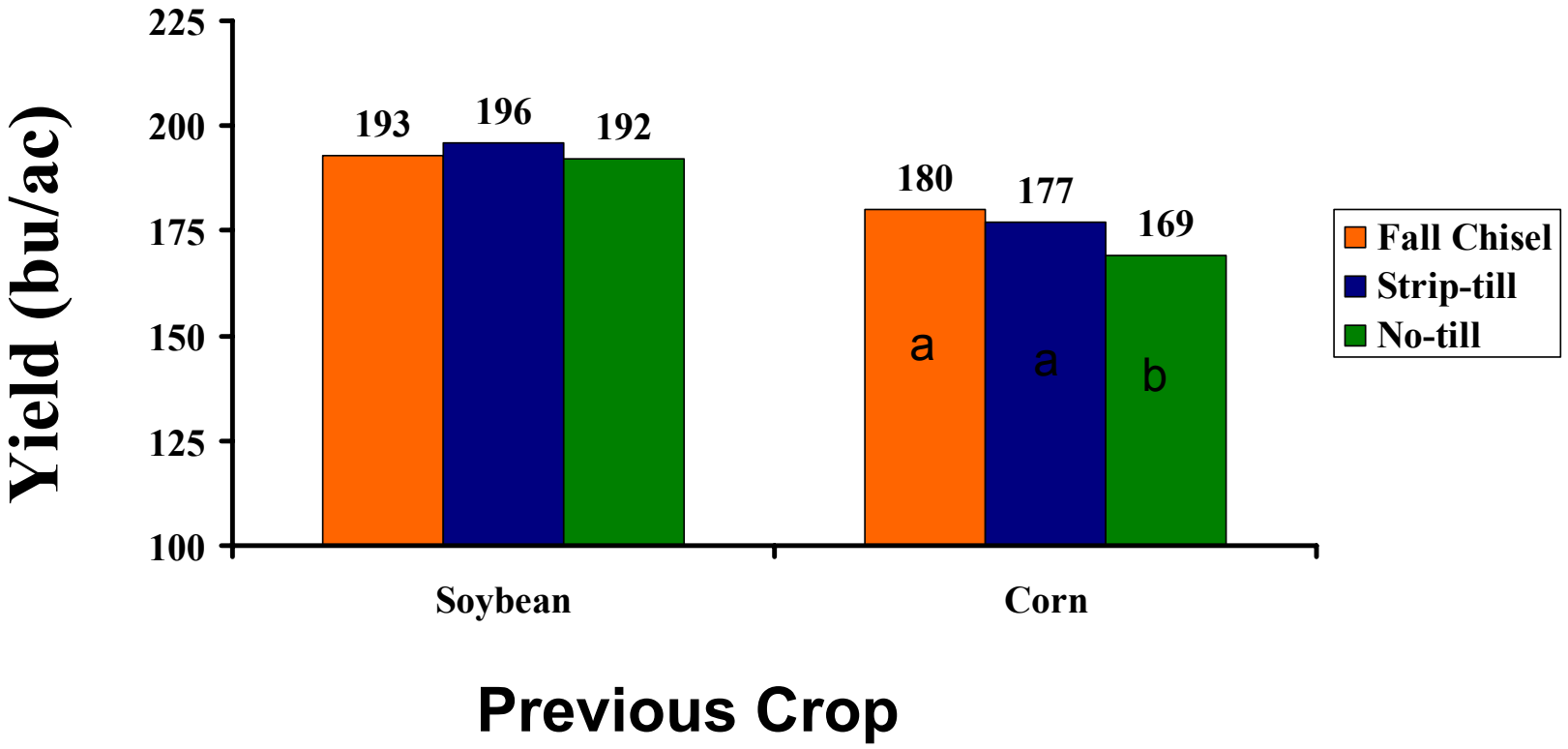
2001-2003 Ontario Yield Summary (courtesy of Greg Stewart, 2004)

Year	PLOW	FALL STRIP	NO-TILL
2001	100	101	100
2002	105	102	100
2003	103	103	100
AVE.	**103**	**102**	**100**

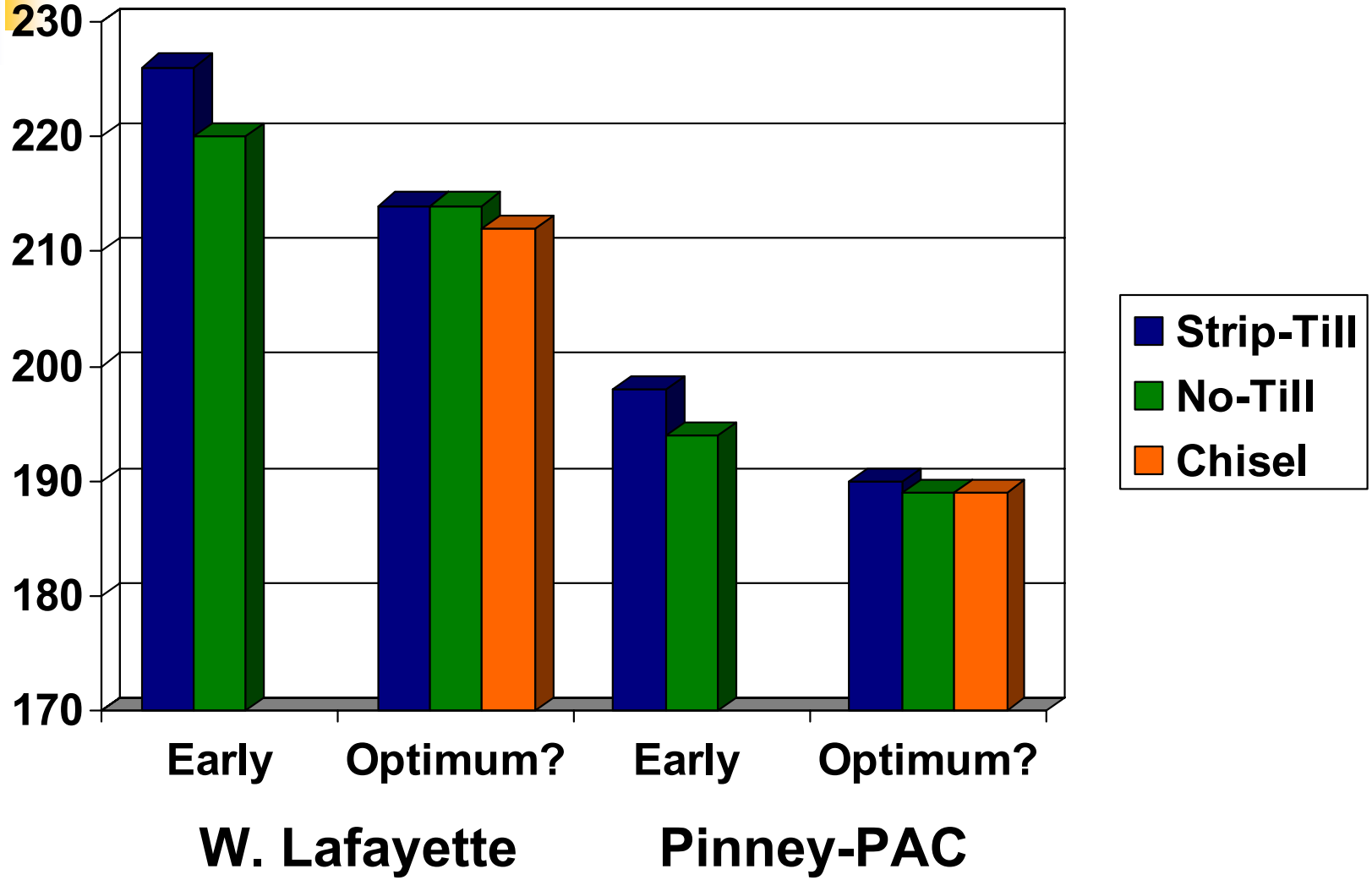
Represents 38 site/year comparisons over the three years.

Strip Tillage for Corn after Corn?

Strip Tillage for Corn in N. Indiana, Loam (2001-03)



Planting Date Effects in Indiana, 2003



Recent Strip Tillage Options

Strip Tillage with Fertilizer Banding

Conclusions

1. No-till corn adoption lower than for soybean, reservations on increased adoption similar in most Mid-west farming areas.
2. Technology changes have improved success rate of No-till and Strip-till.
3. Strip tillage permits increased planting flexibility and opportunity for fertility placement.

Conclusions (continued):

- Fall strip-till provides warmer and drier soil conditions, relative to undisturbed no-till, in the spring before planting. These improved conditions may allow 2-3 days earlier planting in comparison to no-till.

- Fall strip-till resulted in lower penetrometer resistance in comparison to no-till at certain depth intervals.

- Deeper depths of fall strip tillage resulted in a yield advantage when no-till yields were below conventional-till yields.

Thanks!

tvyn@purdue.edu

home page: //www.agry.purdue.edu/staffbio/vyn

Acknowledgements

- Case-DMI (Goodfield, IL.)
- Yetter Equipment (Colchester, IL)
- John Deere (Columbus, OH and Des Moines, IA)
- Remlinger (Kalida, OH)
- Purdue Research Foundation
- OCPA, CanAdapt, OMAFRA, AAFC.