

*The Best of the Best in Wheat Research and Marketing:
Profitable Wheat Production in 2006
Mohall – February 28*

The Latest in No-till:

**Basics of no-till for those transitioning and
the latest technologies for established no-tillers**



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No-Till definition:*

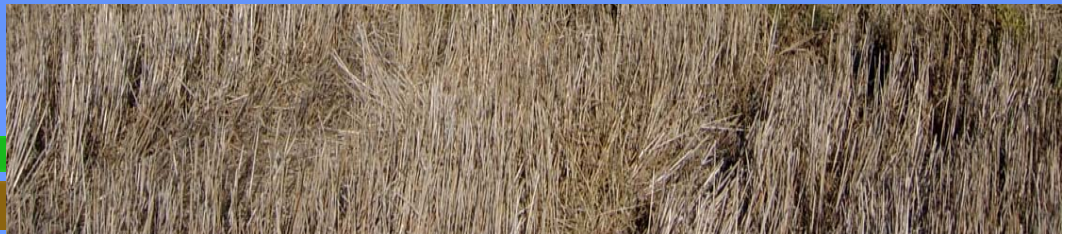
- Economically viable, erosion proof production system in which the crop is planted directly into the previous crop's stubble with minimum soil disturbance.
- Cultural controls such as crop competition and rotations as well as responsible use of (pesticides) herbicides are used to replace tillage.
- Under this system, conservation of soil and soil moisture (management) are special benefits.

No-Till Economic and Agronomic Advantages

- **Government programs**
 - ✓ EQIP and CSP (NRCS)
- **Fuel conservation**
- **Time and labor conservation**
- **Reduce machinery costs?**

No-Till Economic and Agronomic Advantages (continued) - Soils

- Increase soil organic matter
- Preservation of soil structure
- Preservation of earthworms and other soil fauna
- Improved infiltration
- Improved aeration
- Reduce erosion
- Soil moisture conservation
- Moderate soil temperature
- Reduce runoff pollution
- Improved trafficability
- Reduce weed seed germination



Soil improvement with No-till

○ Physical

- Aggregation of soil particles
 - water infiltration and storage
 - less soil erosion

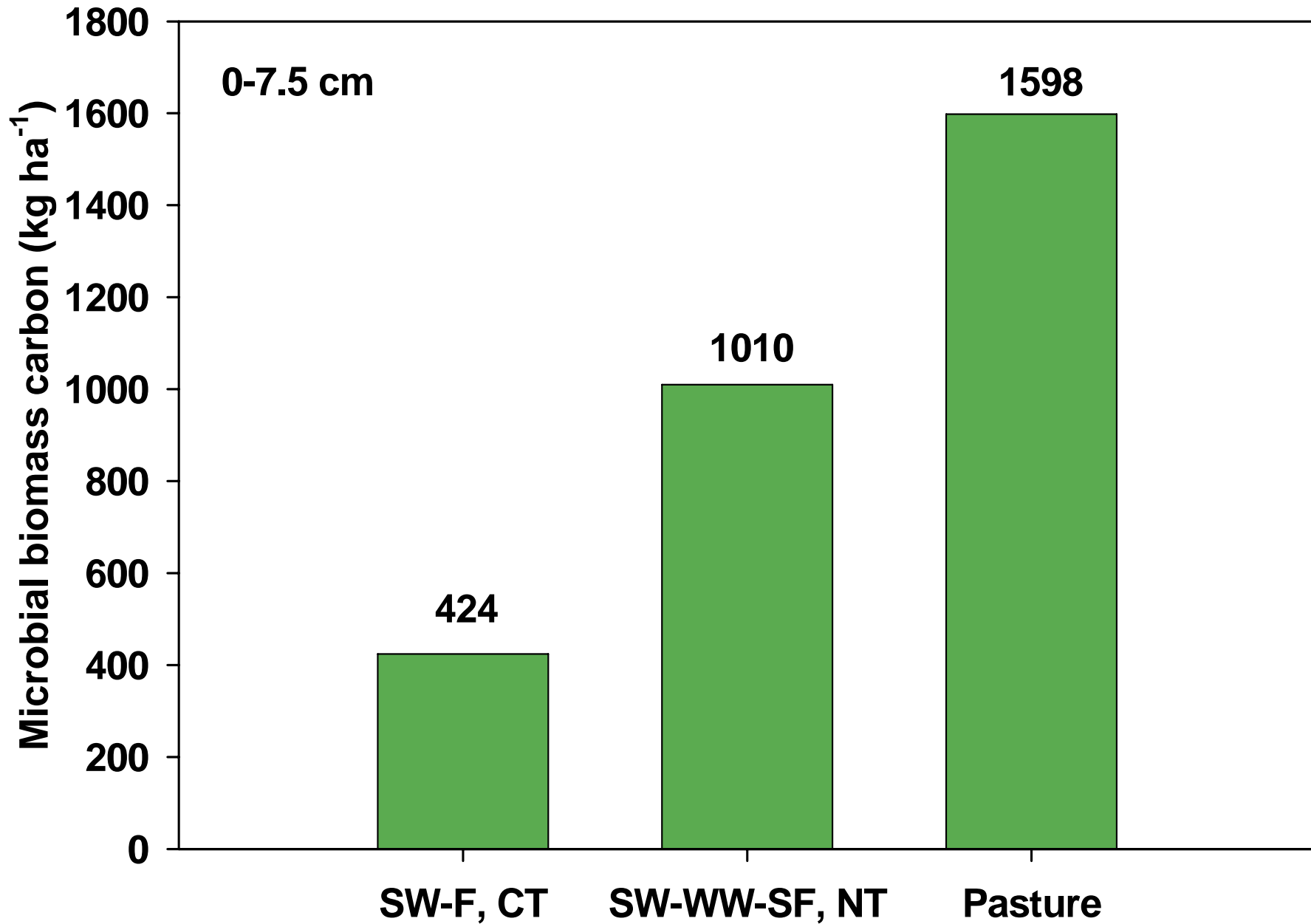
○ Biological

- Improved environment for soil microbes
 - e.g. mycorrhizal fungi, which extends the root system of the plant in exchange for plant carbon

○ Chemical

- Organic matter increase
 - greater long-term storage and availability of nutrients

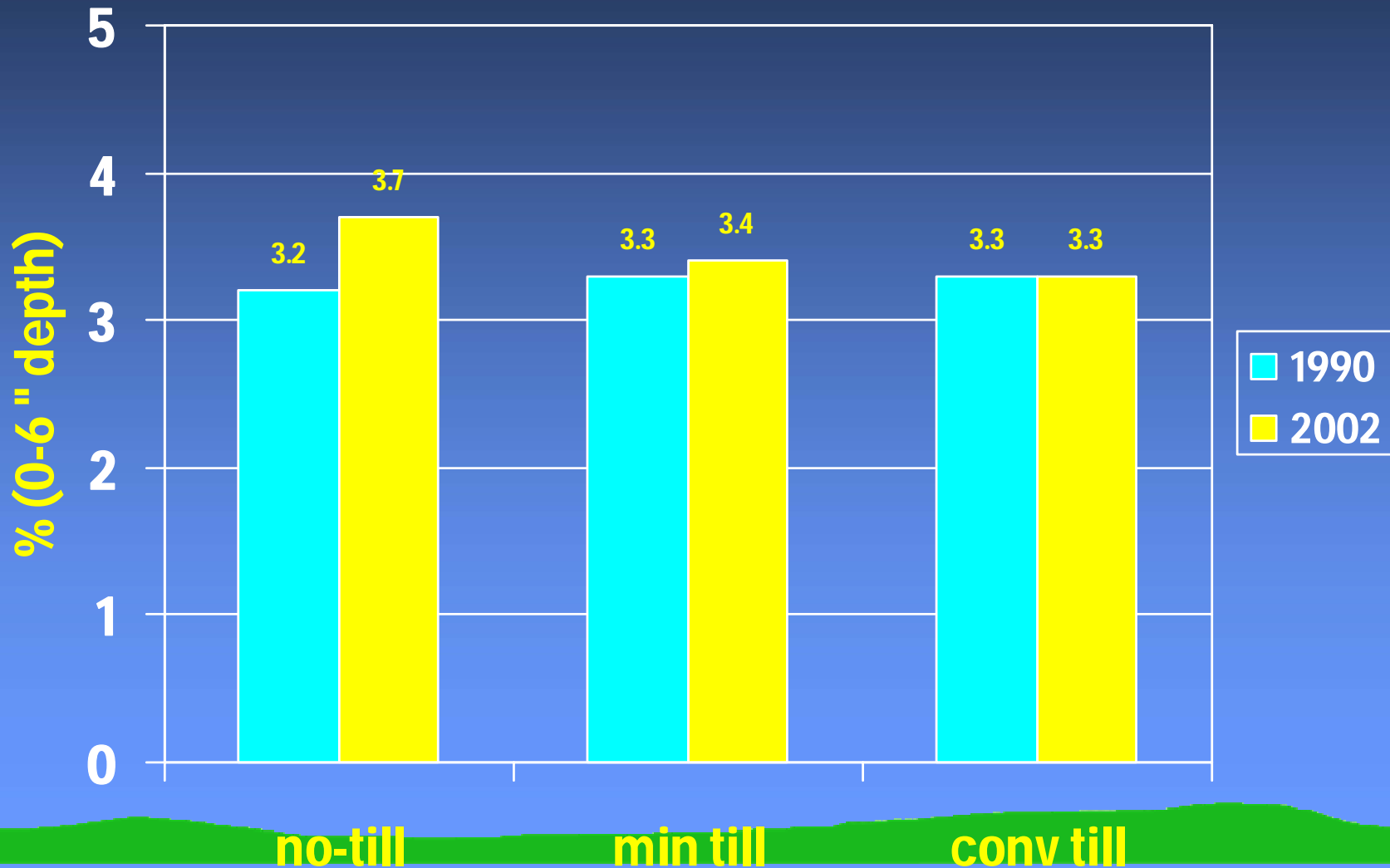
CROPPING SYSTEM EFFECT ON MICROBIAL BIOMASS



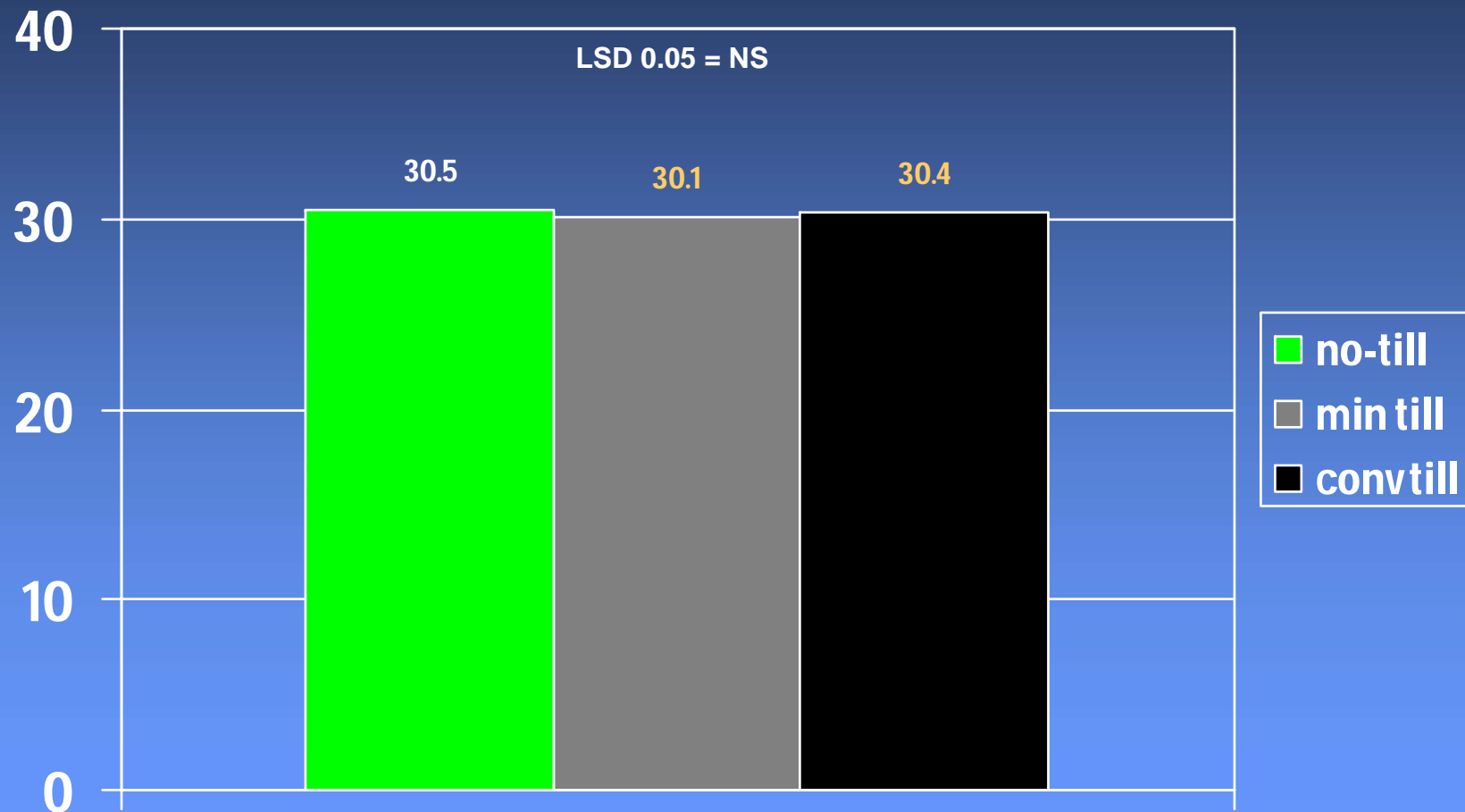
Liebig et al., ARS-Mandan (2004)

Organic matter impact with tillage, 1990 vs. 2002, Carrington

(across N and crop rotations)

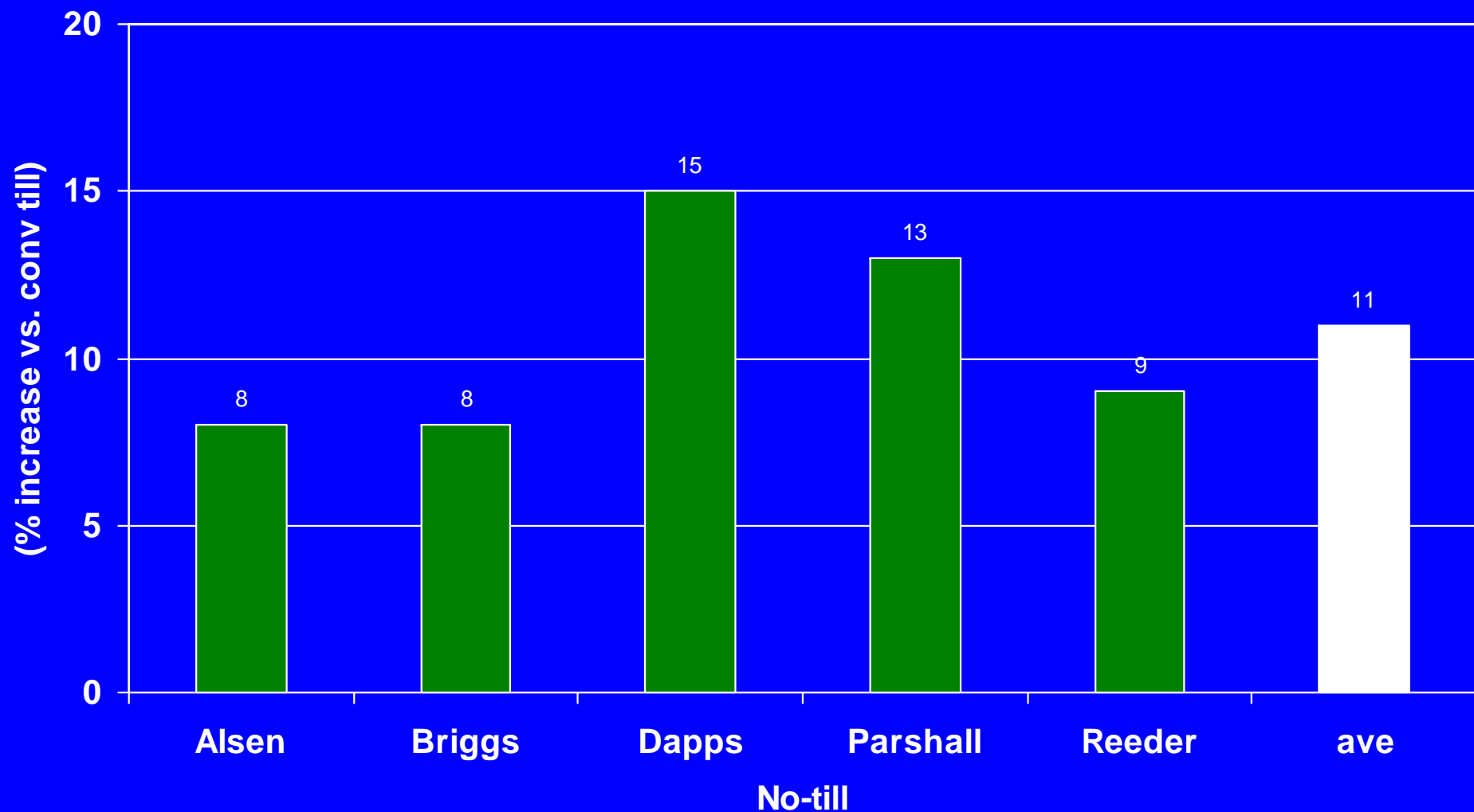


Impact of tillage system on wheat yield, Carrington, 1988-2005 (across rotations and N levels)



Yield (bu/A)

HRS variety yield (% increase) with no-till vs. conventional till, Minot, 2003-05.



Economics



Projected 2006 HRS Wheat Budgets – Southwest ND*

Break Even Market Prices

	Conventional-Till	No-Till
Direct Cost	2.37	2.16
Indirect Cost	2.04	1.25
Total Cost	4.40	3.41

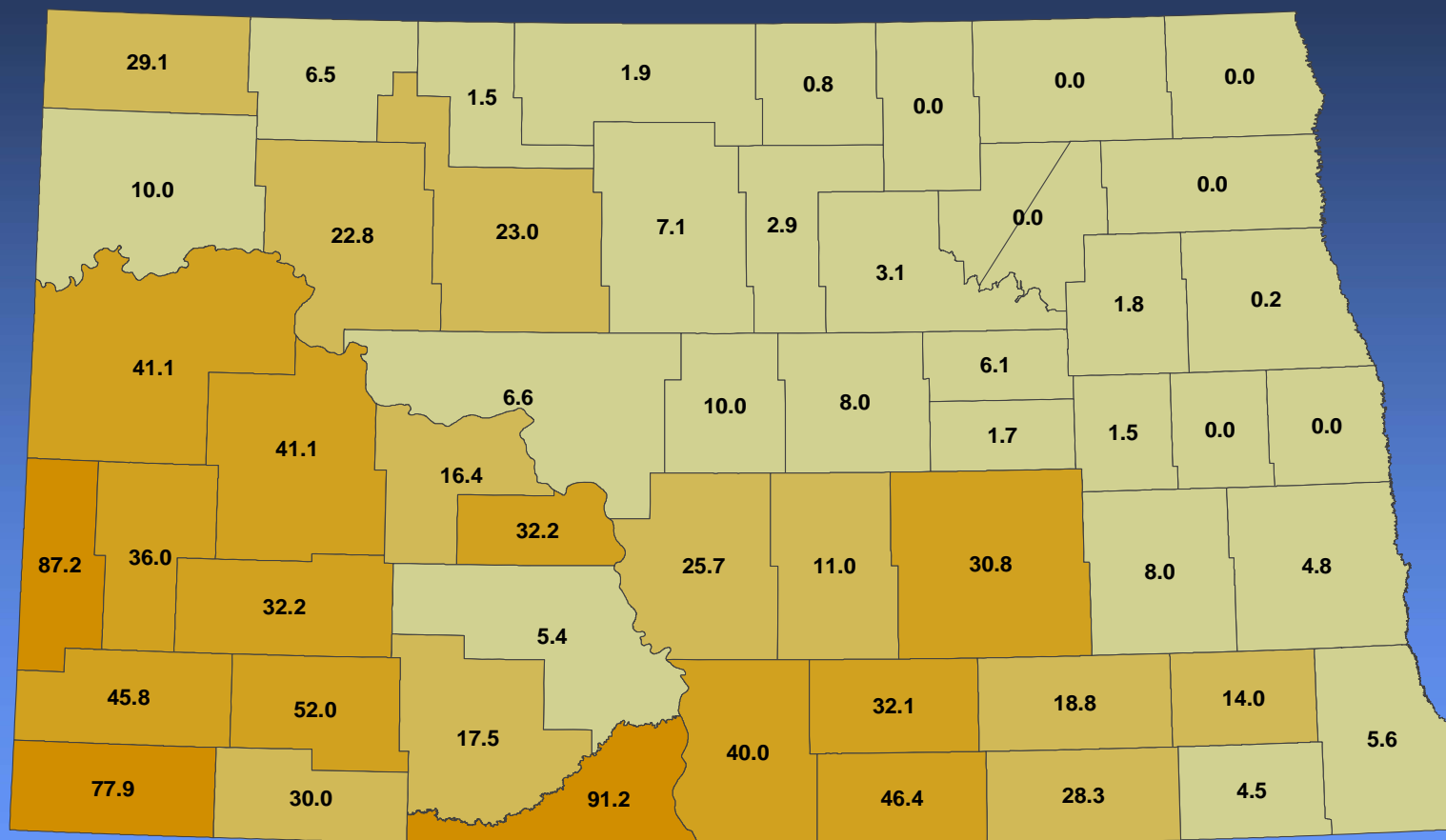
* NDSU Extension Service: www.ext.nodak.edu/extpubs/ecguides.htm

Direct expenses with no-till vs. conventional-till wheat on soybean ground

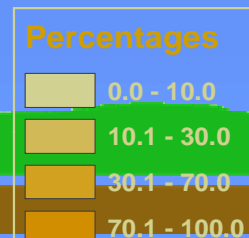
No-till		Conventional	
Seeding/fert	\$13.72	Spread fert	\$4.00
Spray	X	Cultivate	\$3.81
Combine	X	Seed	\$10.56
		Spray	X
		Combine	X
Totals	\$13.72		\$18.37

Spring-seeded small grain: No-till acres, ND, 2004.

No-Till Seeded Acres as a Percent of Total

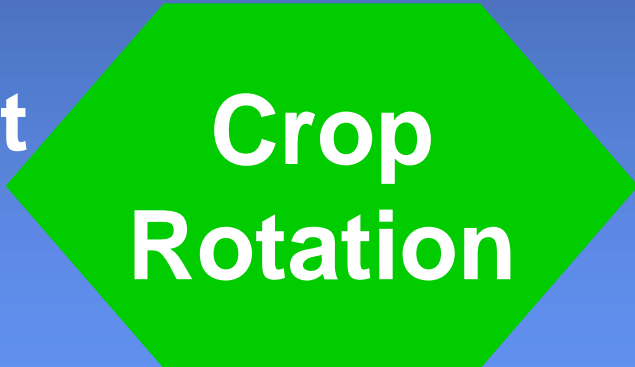


Source: Conservation Technology
Information Center 2004 Crop
Residue Management Survey



No-till Challenges

- Crop establishment with increased crop residue on the soil surface.
 1. Change in management system
 2. Residue management
 3. Soil Water management
 4. Seeding equipment
 5. Plant nutrition
 6. Pest management
 - Weeds and disease



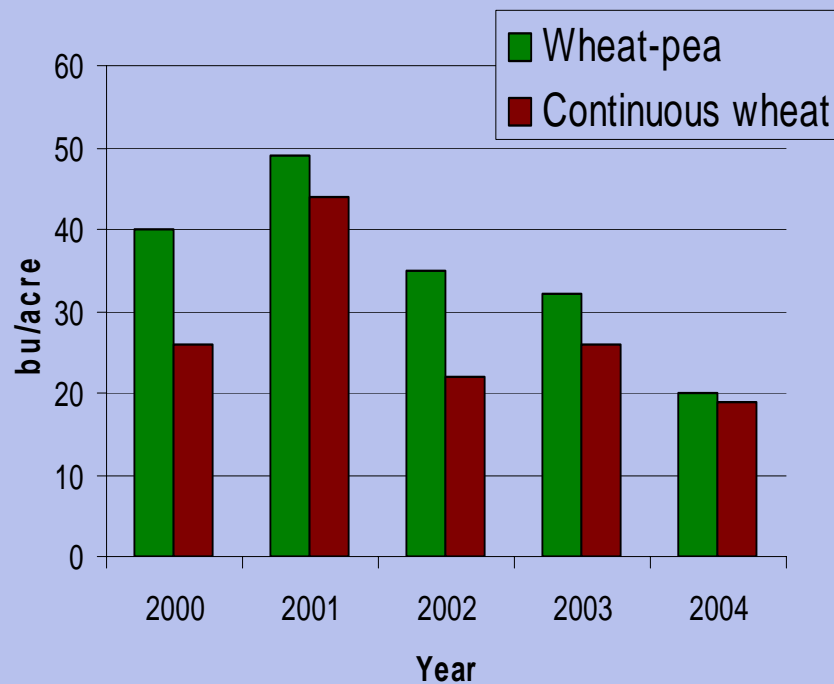
**Crop
Rotation**

BENEFITS OF ROTATION

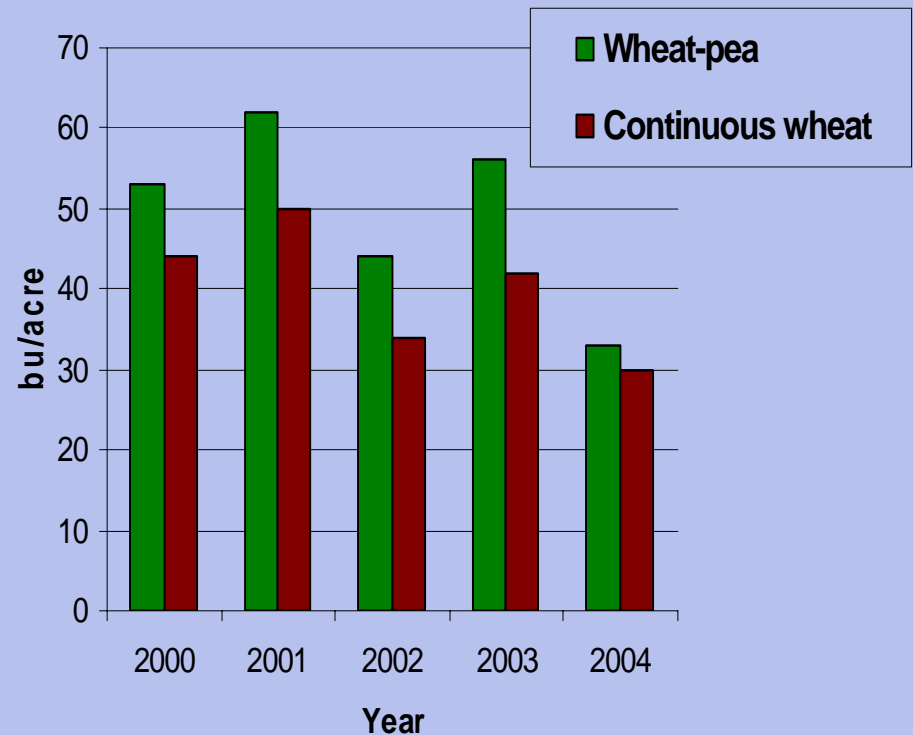
- The more diverse the current crop is from the previous crop, the higher the yield potential
- Rotation reduces the selective build up of pests in a given crop
- Tool for residue management
- Allows crops to properly manage moisture in a particular geographic area
 - utilize additional moisture available from no-till

Rotation and Tillage Systems comparison

Dickinson Rotation Study
Crop Effect - Clean Tillage

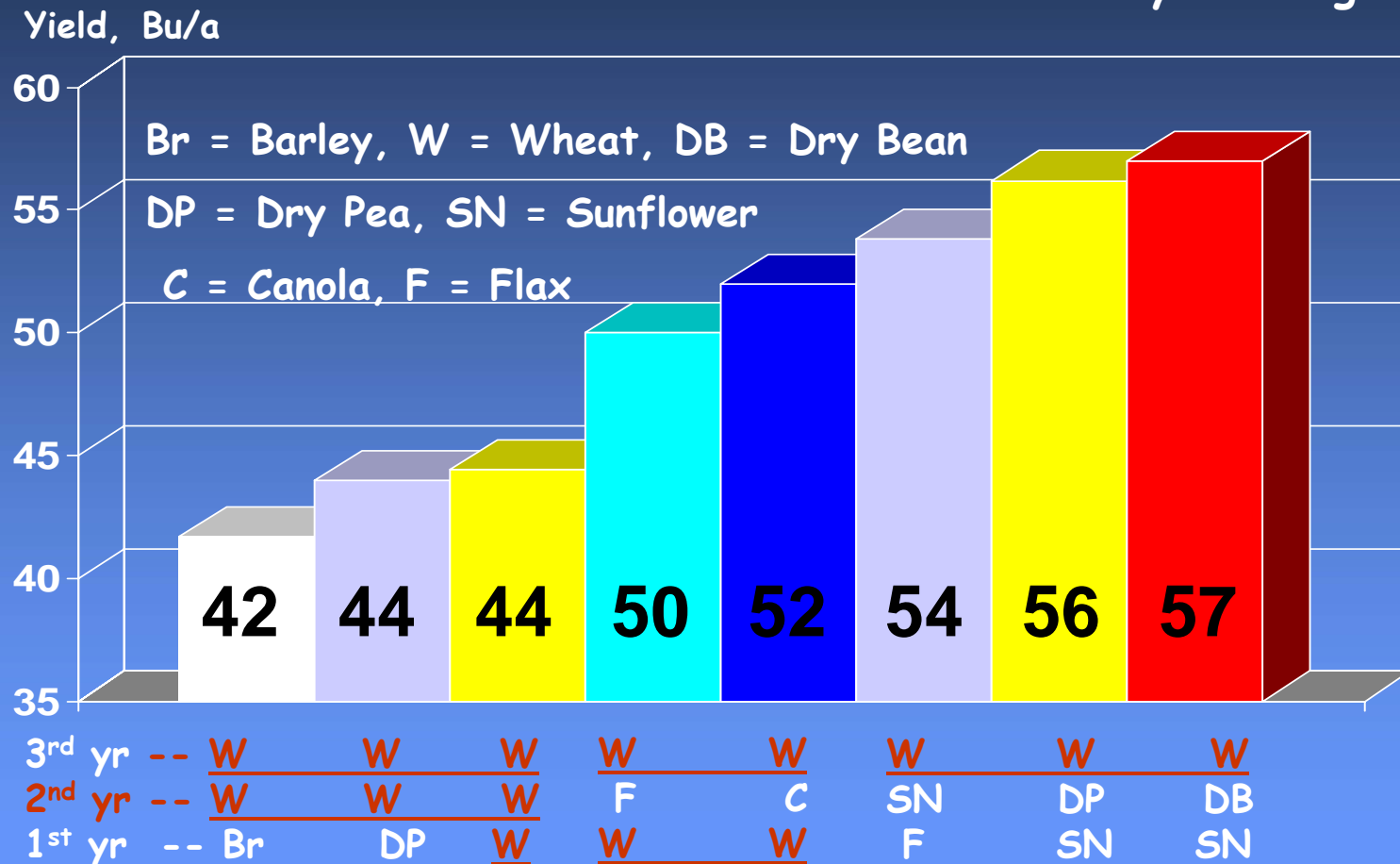


Dickinson Rotation Study
Crop Effect - No Till

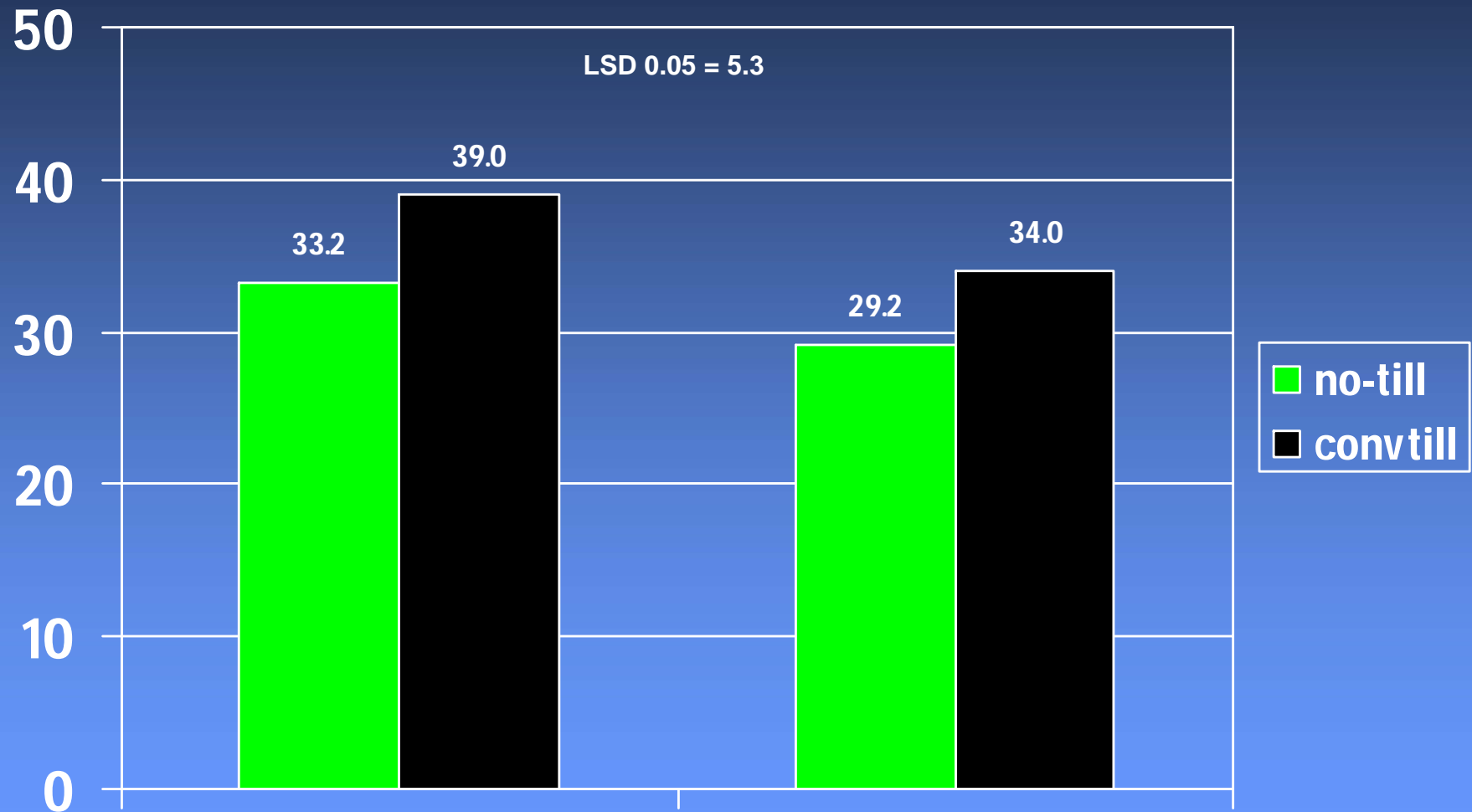


Spring Wheat Yield after Selected Crop Sequences, Mandan

2 yr average



Impact of tillage system and previous crop on wheat yield, Carrington, 2003-05.



Soybean

Wheat

FIELD
STREAM

The

50



Best Guns
Ever Made

BY DAVID E. PETZAL

Crop Rotation and No-till references (selected):

- “The Power Behind Crop Rotations”
 - www.dakotalakes.com
- “Crop Sequence Calculator”
 - www.mandan.ars.usda.gov
- Manitoba ND Zero Tillage Farmers Association
 - www.mandakzerotill.org
- NDSU Extension Service
 - www.ag.ndsu.nodak.edu/

CORN IN WHEAT STUBBLE



Photo by Walt Albus

Strip Tillage

- 6-8" strips are cleared and fertilizer banded within strips in fall
 - Shovel shank lifts soil and creates a mini-ridge or berm
- Plant directly in cleared strips in spring



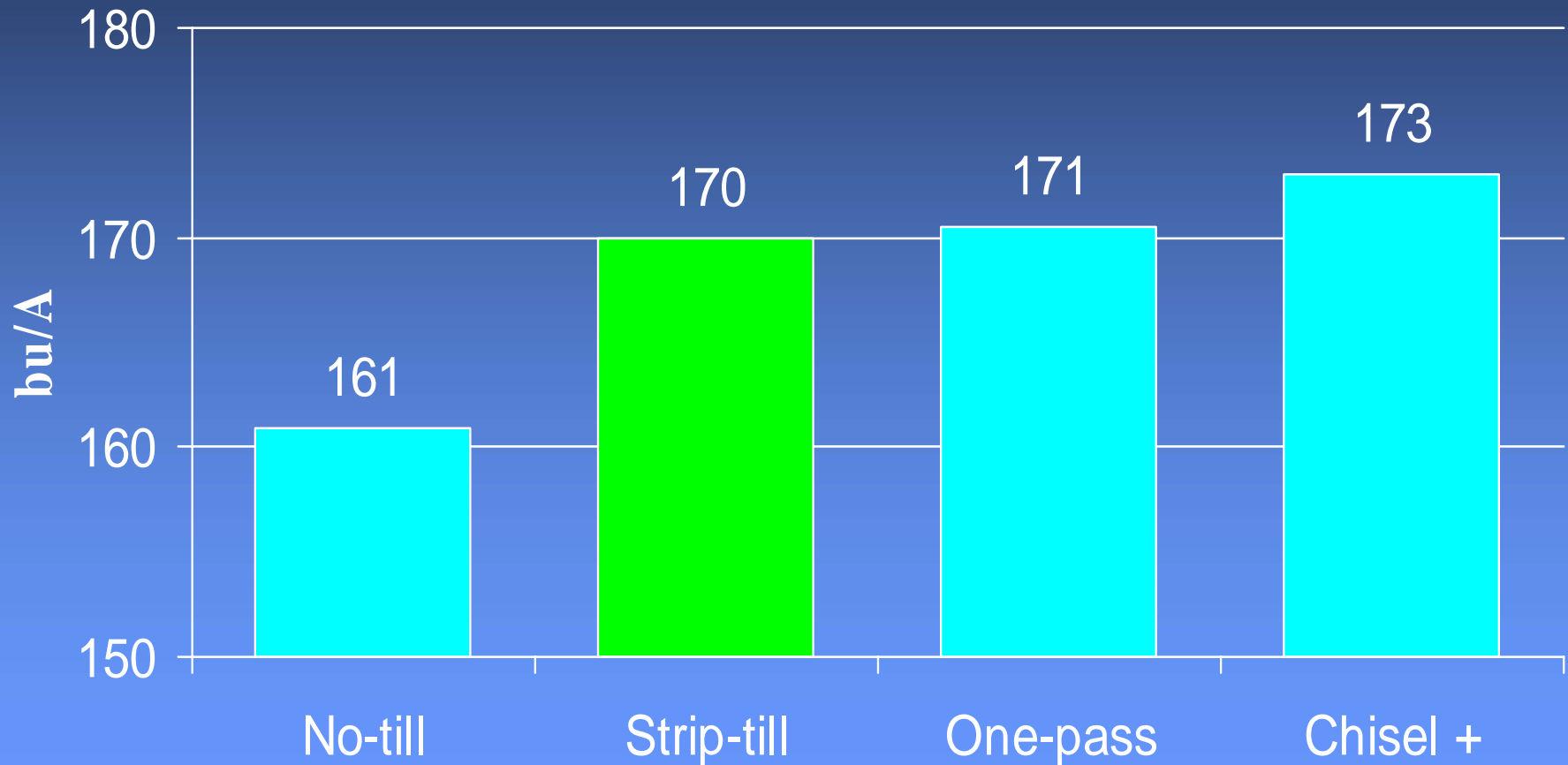
Strip-Till

Benefits/Challenges

- Maintains surface residue
 - Soil warms up like conventional tillage in planting zone
 - Less energy and time required compared to conventional till
 - Banded P efficiency
- Additional equipment:
 - tool bar with tillage components
 - auto steer (optional?)
 - Plant establishment may be significantly reduced if seed is planted off of berm
 - Is different equipment or management needed?
 - Residue movement back into berm

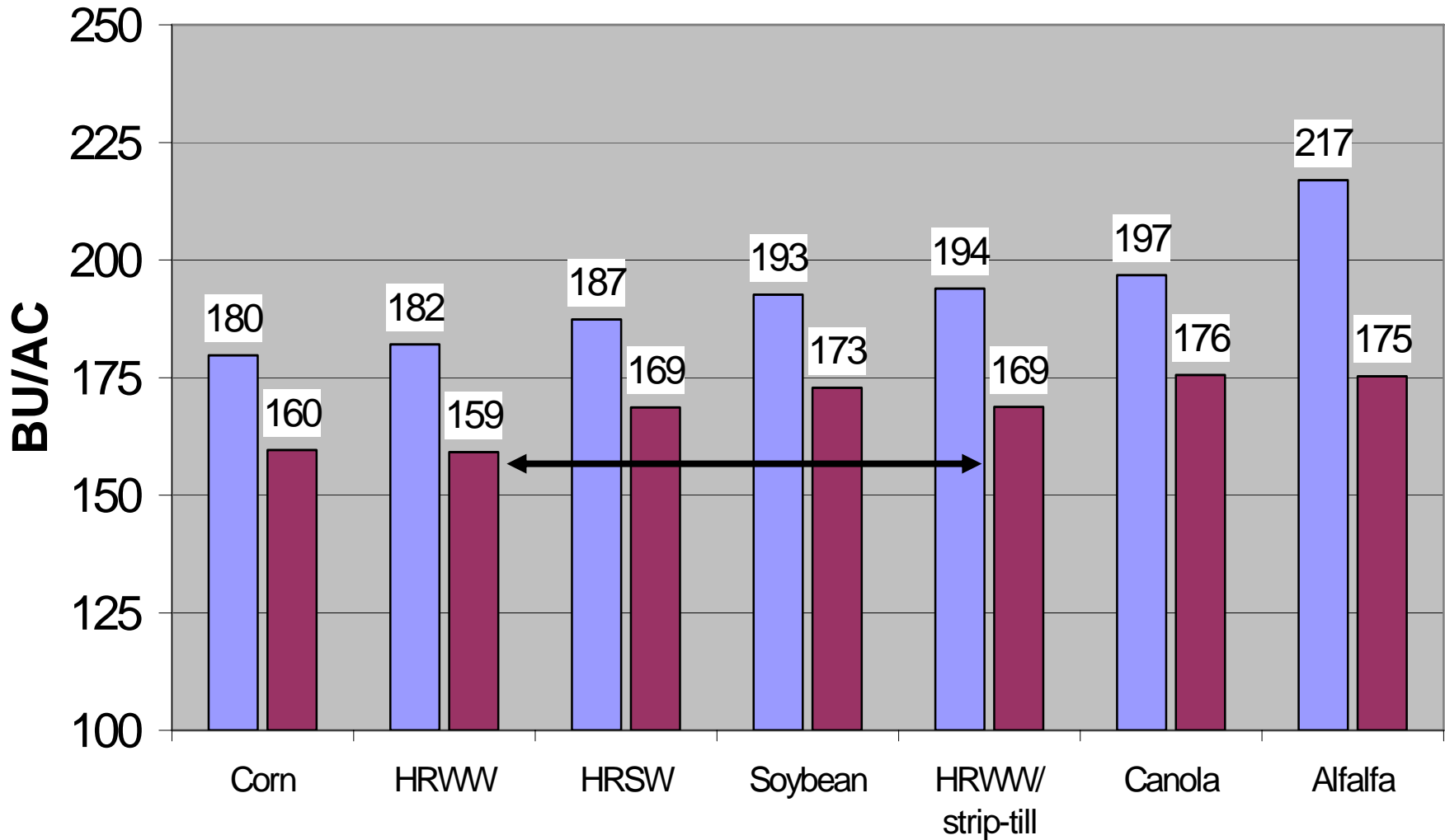


Corn Yields and Tillage, Waseca, MN (25 site-years)



Tillage for Corn following Soybean

CCSP CORN 2004-2005

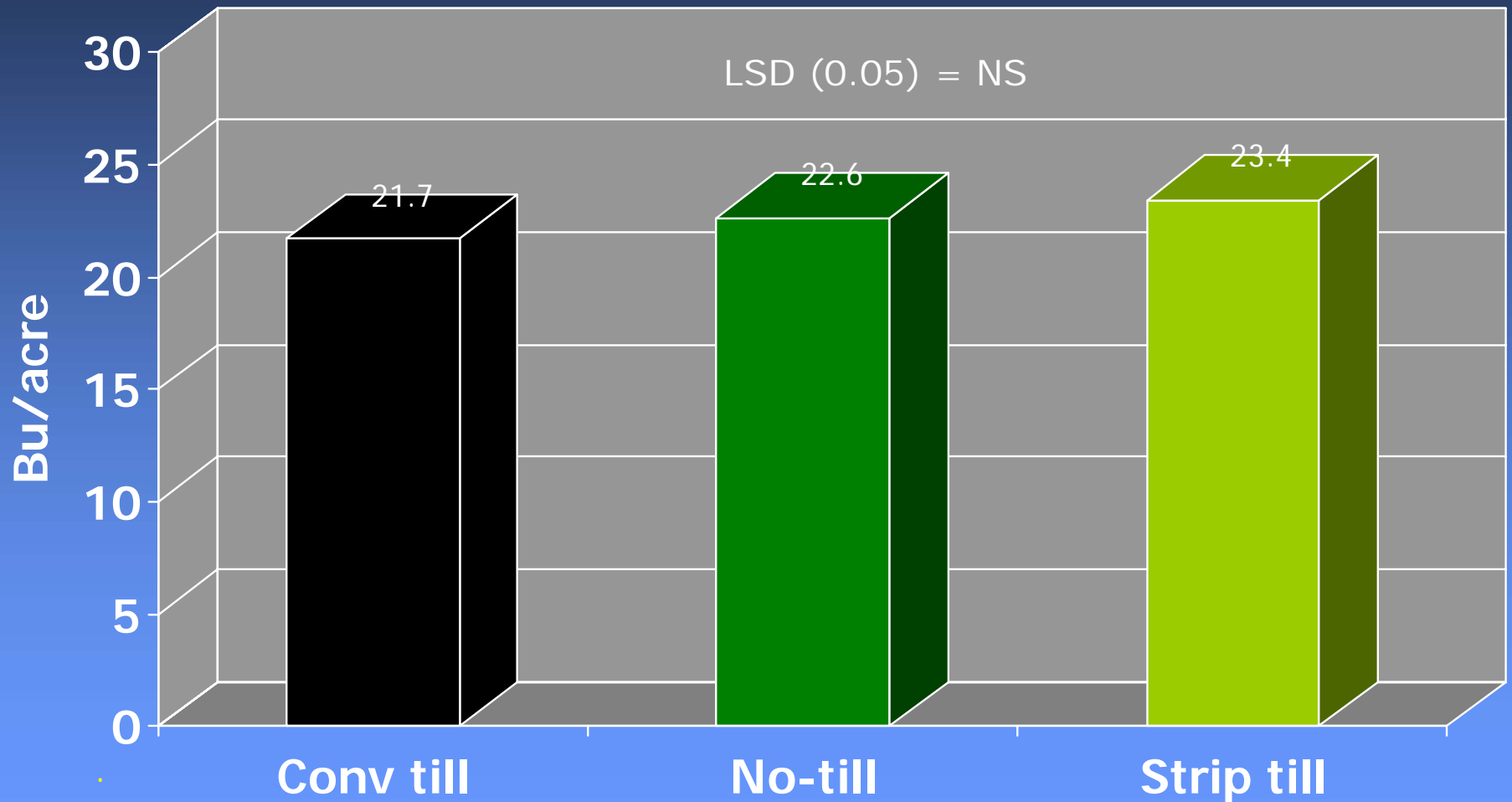


PREVIOUS CROP

2005 mean 2004-2005

W. Albus

Soybean yield with tillage systems, Carrington, 2005*.



*21-inch row spacing on wheat stubble

Endres, Bradley and Henson

- Advantages and challenges exist with both general types of openers



- Both successfully used!

Openers

○ Single Disc

- minimal soil disturbance
- seeding depth control
- less horsepower

○ challenges

- wet soils and heavy, wet residue
- ✓ Leaving the straw connected to the soil (vertical) and even distribution of the residue will reduce 'hair-pinning' at seeding time
- less fertilizer application options
- less options for residue managers and furrow closure
- bearing replacement

● other?



Openers

○ Shank or Narrow Hoe

- Easier to handle wet soil and residue
 - wider band of black soil for quicker drying and warm-up
 - no hair-pinning
- Greater fertilizer application options
 - seed furrow application; NH₃
- Smooths field over time
- Challenges:
 - more soil disturbance than disc
- Other?



Effect of Opener Disturbance, Saskatchewan, 1998-2001.

Grain yield (bushels/acre)

	Disc	Knife	Spoon	Sweep
Peas	35.8	31.5	31.5	31.6
Barley	30.6	28.0	24.3	24.8
Durum	21.4	20.0	17.5	18.4

*All openers on 9-inch row spacing; Knife=0.75 inch,
Spoon=2.25-inch, and Sweep=12-inch width.

Source: Derksen, D., P. Watson, B. Nybo, and B. McConkey, 2002

Wheat performance based on openers, CCSP, Forman*.

- Single disk and shank openers used with no-till winter and HRS wheat grown in generally wet conditions
- Preliminary data:
 - Over several years, yield was similar (varied by year)

Exactrix

- Delivers liquid NH₃ to the soil at high pressures
 - Allows application in no-till with soil separation from seed using single-disc opener
 - Seed injury in coarse and/or dry soils?
 - Reduction in N rate (30-50%)
 - Plant requires X amount of N
 - Masked by no-till system?
 - Off-set by equipment costs?
- www.exactrix.com
 - 3rd party (university or USDA) research data?

Exactrix – Kevin Black farm, Grace City, 2005



- Canola seeded at $\frac{3}{4}$ -inch depth at 3 lb/A in 15-inch row spacing with single-disc air seeder
- Dry P applied with seed and NH₃ 2-3 inches to side at 70 lb N/acre using Exactrix
- Fertilizer also applied as mid-row band
- “N rate reduced about 40% using Exactrix with good canola yield”

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Questions or Comments?