TILLAGE MANAGEMENT FOR MANURED CROPLAND

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THE PRACTICAL GOAL OF MANURE MANAGEMENT

- KEY PART OF THE NUTRIENT MGT. PLAN
- DISTRIBUTE MANURE EVENLY ON THE FARM
  - AVOID SOIL P BUILDUP
- SELECT RATE TO UTILIZE PLANT NUTRIENTS
  - N OR P BASED MANAGEMENT
- AVOID APPLICATION IF LOSSES MAY OCCUR
  - STEEPLY SLOPING LAND
  - ADJACENT TO WATER
  - SANDY SOILS
- BALANCE NUTRIENT USE AND DISPOSAL NEED

WHAT THE FUTURE HOLDS

- NMP WILL ALLOCATE MANURE TO MORE ACRES ON A FARM
- MORE MANURE MAY HAVE TO BE APPLIED ON ERODIBLE LAND AND TO FIELDS NEAR SURFACE WATER
- ROTATIONS ON ERODIBLE LAND POSSIBLE BECAUSE OF CONSERVATION TILLAGE
- DIFFICULT PLANTING INTO RESIDUE WITH HIGH SURFACE MANURE RATES

A GREATER CHALLENGE FOR SEMI-SOLID, DAILY HAUL

NO-TILL

LIGHT DISKING

STRIP-TILL

ALTERNATIVES TO FULL-WIDTH TILLAGE

GREATER FLEXIBILITY WITH LIQUID SYSTEMS

GREATER FLEXIBILITY WITH LIQUID SYSTEMS

"Residue Friendly" Incorporation

WHAT DOES NRCS-590 SAY

CRITERIA FOR ALL SITES

- "T" SHALL NOT BE EXCEEDED
- FOLLOW UWEX RECOMMENDATIONS
- MANURE SHALL NOT BE SPREAD IN CONCENTRATED
- FLOW CHANNELS
- ESTABLISH PERRENIAL VEGETATION IN CONCENTRATED FLOW CHANNELS
- FROZEN/SNOW-COVERED GROUND:
  - MANURE SHALL NOT BE SPREAD w/in 1000' OF LAKES AND 300' OF STREAMS
  - MANURE SHALL NOT BE SPREAD w/in 200' UPSLOPE OF WELLS, SINKHOLES, GRAVEL PITS
  - CAN'T EXCEED CROP'S P REMOVAL
  - LIMIT LIQUID MANURE TO 7,000 gal/a
  - CAN'T APPLY ON SLOPES > 9 % (SOME EXCEPTIONS)

WHAT DOES NRCS-590 SAY

CRITERIA FOR SURFACE WATER PROTECTION

- USE PHOSPHORUS INDEX TO RANK FIELDS
- *OR*
- BASE APPLICATION ON SOIL TEST P
  - < 50 ppm P: BASE ON CROP N NEED
  - 50 – 100 ppm P: CAN'T EXCEED REMOVAL FOR 4 YEAR ROTATION
  - > 100 ppm P: APPLICATION LESS THAN P REMOVAL
    - PLUS: > 30% RESIDUE *or* FALL COVER CROP *or* CONTOUR *and/or* BUFFER STRIPS
- APPLICATION IN NON-FROZEN SWQMA'S REQUIRE:
  - BUFFERS *or* >30 % RESIDUE *or* FALL COVER CROPS *or* INCORPORATION THAT MEETS "T"

SOME POTENTIAL ISSUES

- PLANTER PERFORMANCE, SLOW EMERGENCE, POOR STANDS, REDUCED YIELD
- TILLAGE = LESS RESIDUE = MORE EROSION = MORE (TOTAL P) LOSS
- WHICH IS MOST IMPORTANT? THE SOIL CONSERVATION OR NUTRIENT MGT. PLAN

THE CONSERVATION PLAN MUST COME FIRST

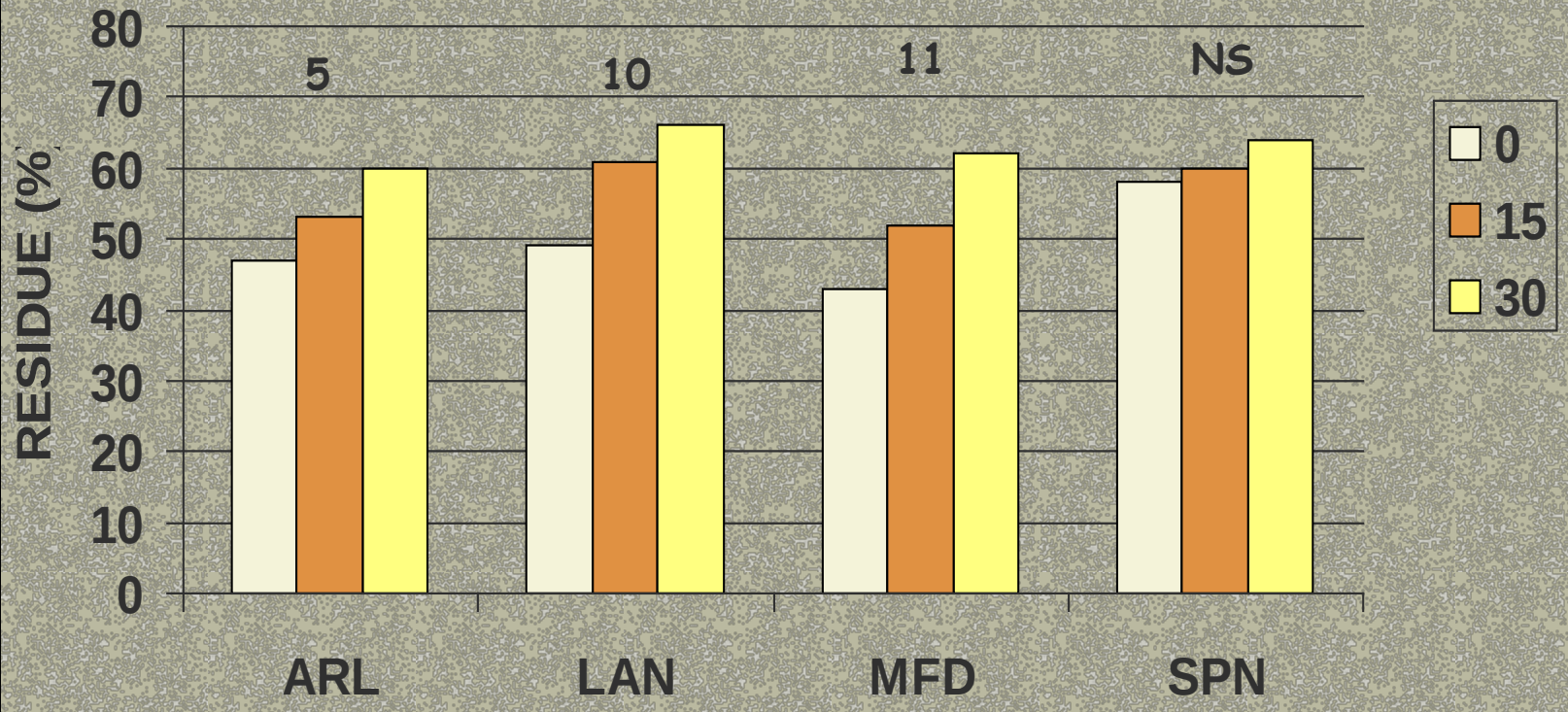
- ESTABLISHES PRACTICES TO MEET "T"
  - ROTATION
  - TILLAGE INTENSITY
  - SUPPORTING CONSERVATION PRACTICES
- MANAGES RESIDUE AND LANDSCAPE TO PROTECT WATER QUALITY AND MAINTAIN SOIL PRODUCTIVITY
- MANY ARE OUTDATED OR NOT FOLLOWED

IS THERE A "HAPPY MEDIUM" BETWEEN MANURE AND RESIDUE MANAGEMENT

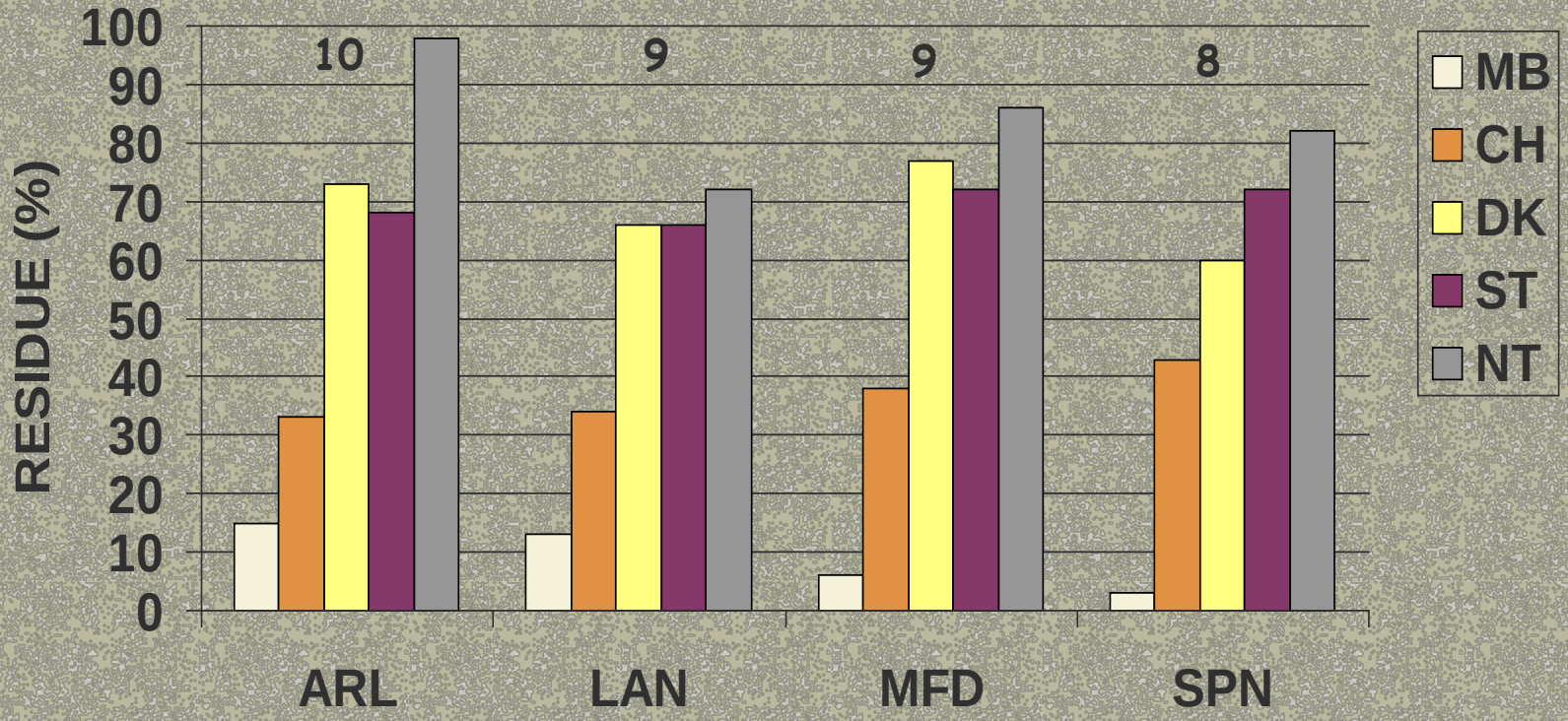
MANURE AND TILLAGE MANAGEMENT STUDY: 2002-2003

- ARLINGTON, LANCASTER, MARSHFIELD, AND SPOONER
- 0, 15, AND 30 t/a SPRING-APPLIED, STRAW-BEDDED MANURE
- MOLDBOARD, CHISEL, LIGHT DISK, STRIP-TILL, NO-TILL
- N RATES (ARLINGTON ONLY)
- EMERGENCE, STAND, RESIDUE, YIELD
- SUPPORTED BY A MULTI-AGENCY LAND AND WATER EDUCATION GRANT

MAIN EFFECT OF MANURE RATE ON THE SURFACE CROP RESIDUE, 2003



MAIN EFFECT OF TILLAGE ON THE SURFACE CROP RESIDUE, 2002



COMMENTS ON THE EFFECT OF MANURE ON CROP RESIDUE

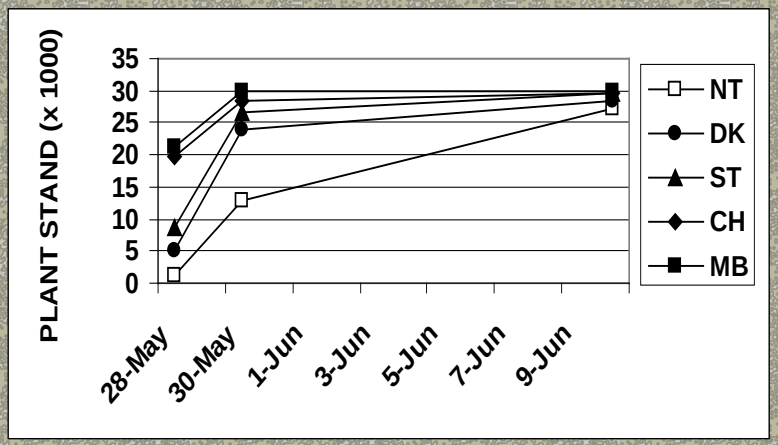
- NO-TILL RESULTED IN ABOUT 90 % RESIDUE COVERAGE
- MOLDBOARD PLOWING RESULTED IN ABOUT 10 % COVERAGE
- LIGHT DISKING OR STRIP-TILL REDUCED RESIDUE ABOUT 15 % COMPARED TO NO-TILL
- AT THE 30 t/a RATE MANURE INCREASED CROP RESIDUE ABOUT 13 %
- TILLAGE EFFECTIVENESS DECREASED WITH ADDED MANURE

RESIDUE INCORPORATION RATIO AS AFFECTED BY MANURE (2003)

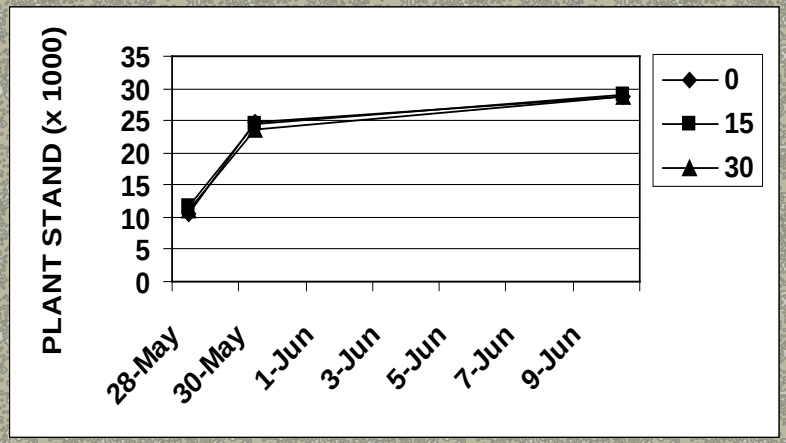
TILLAGE	MANURE RATE (t/a) 0	15	30
STRIP	0.19	0.20	0.14
DISK	0.38	0.30	0.27
CHISEL	0.51	0.36	0.34
MOLDBOARD	0.90	0.92	0.88

RESIDUE INCORPORATION RATIO = 1 – {% RES_T / % RES_{NT}}

EFFECT OF TILLAGE AND MANURE RATE ON CORN EMERGENCE, ARLINGTON, WIS., 2002

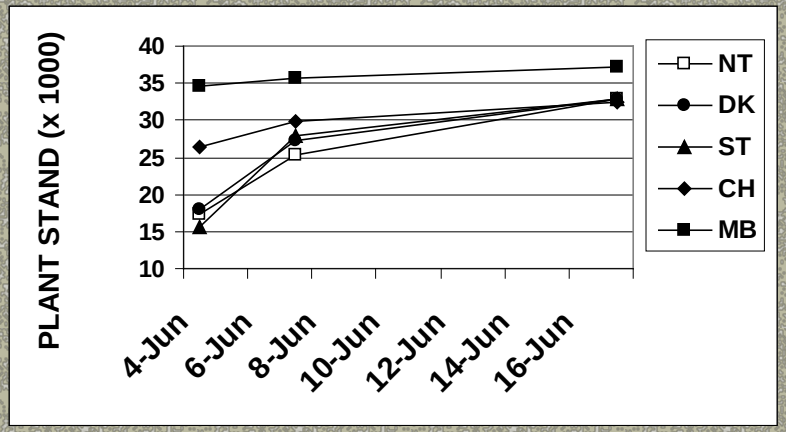


TILLAGE EFFECT



MANURE EFFECT

EFFECT OF TILLAGE AND MANURE RATE ON CORN EMERGENCE, MARSHFIELD, WIS., 2002



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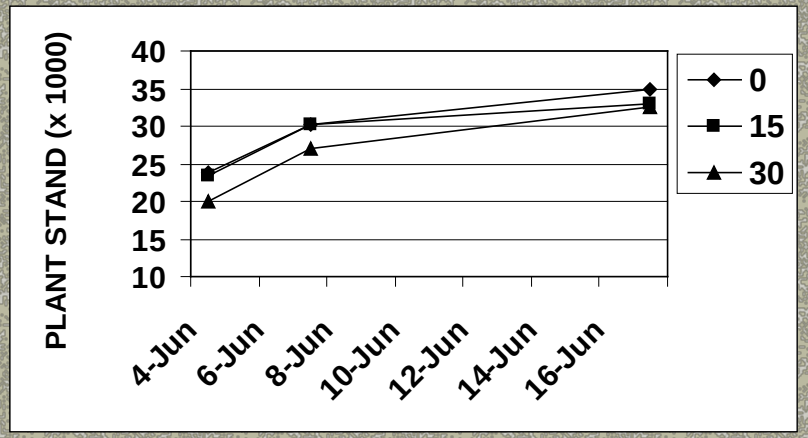
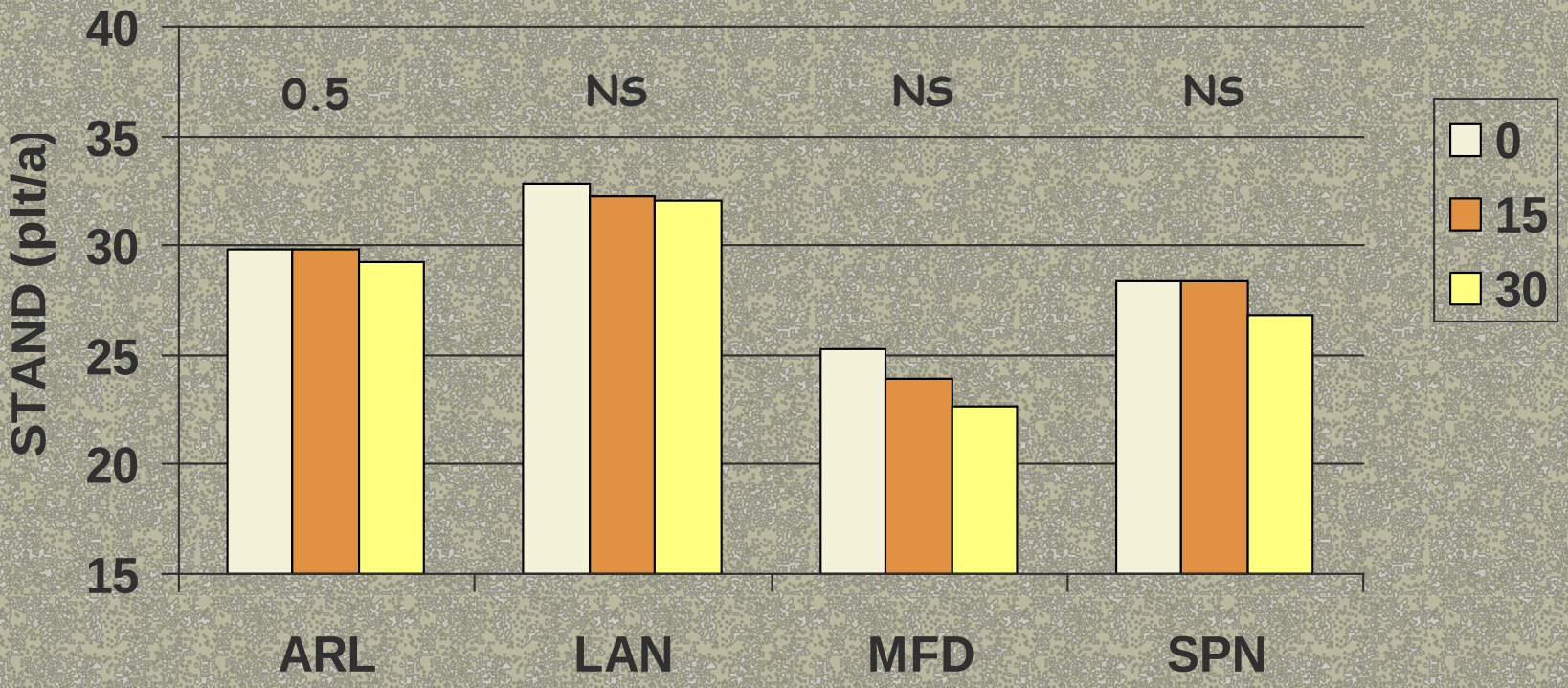


MANURE EFFECT

MAIN EFFECT OF MANURE RATE ON THE FINAL CORN STAND, 2003



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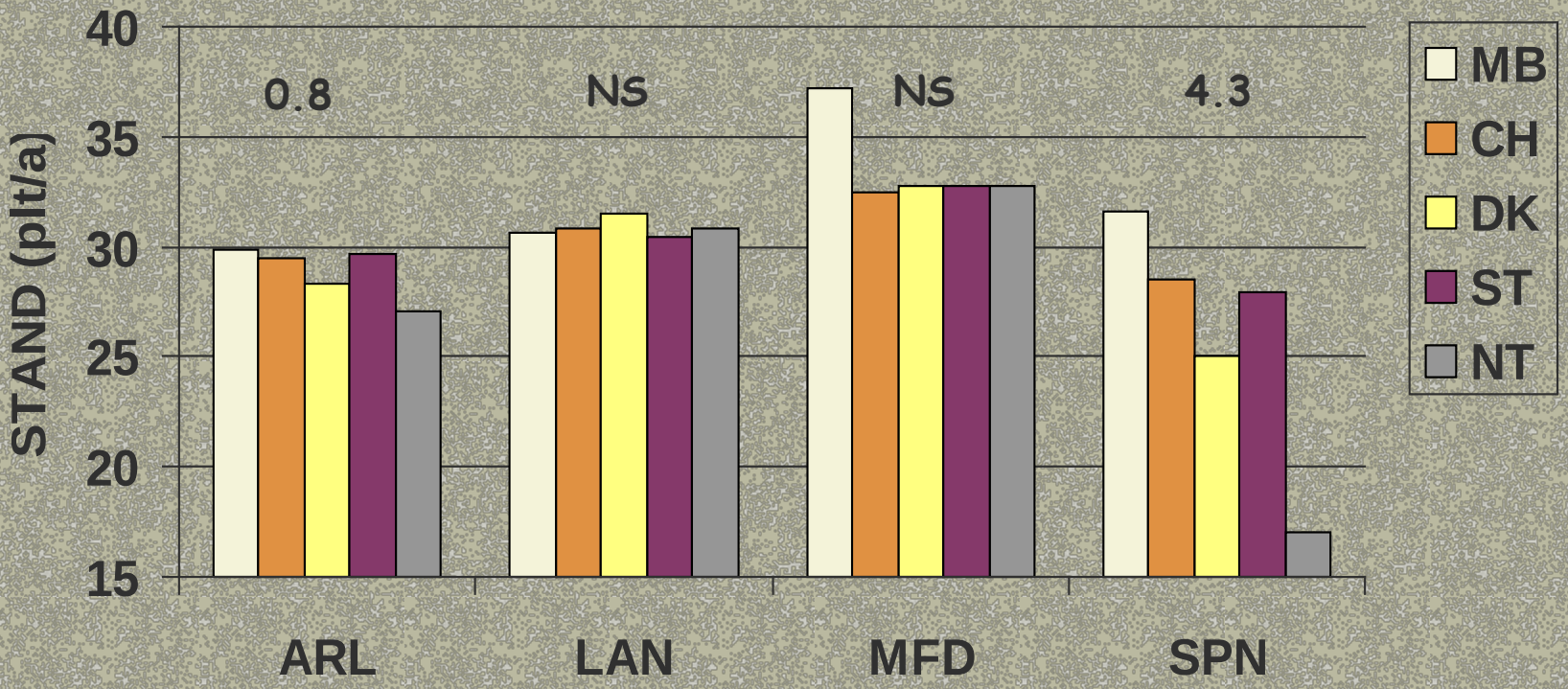
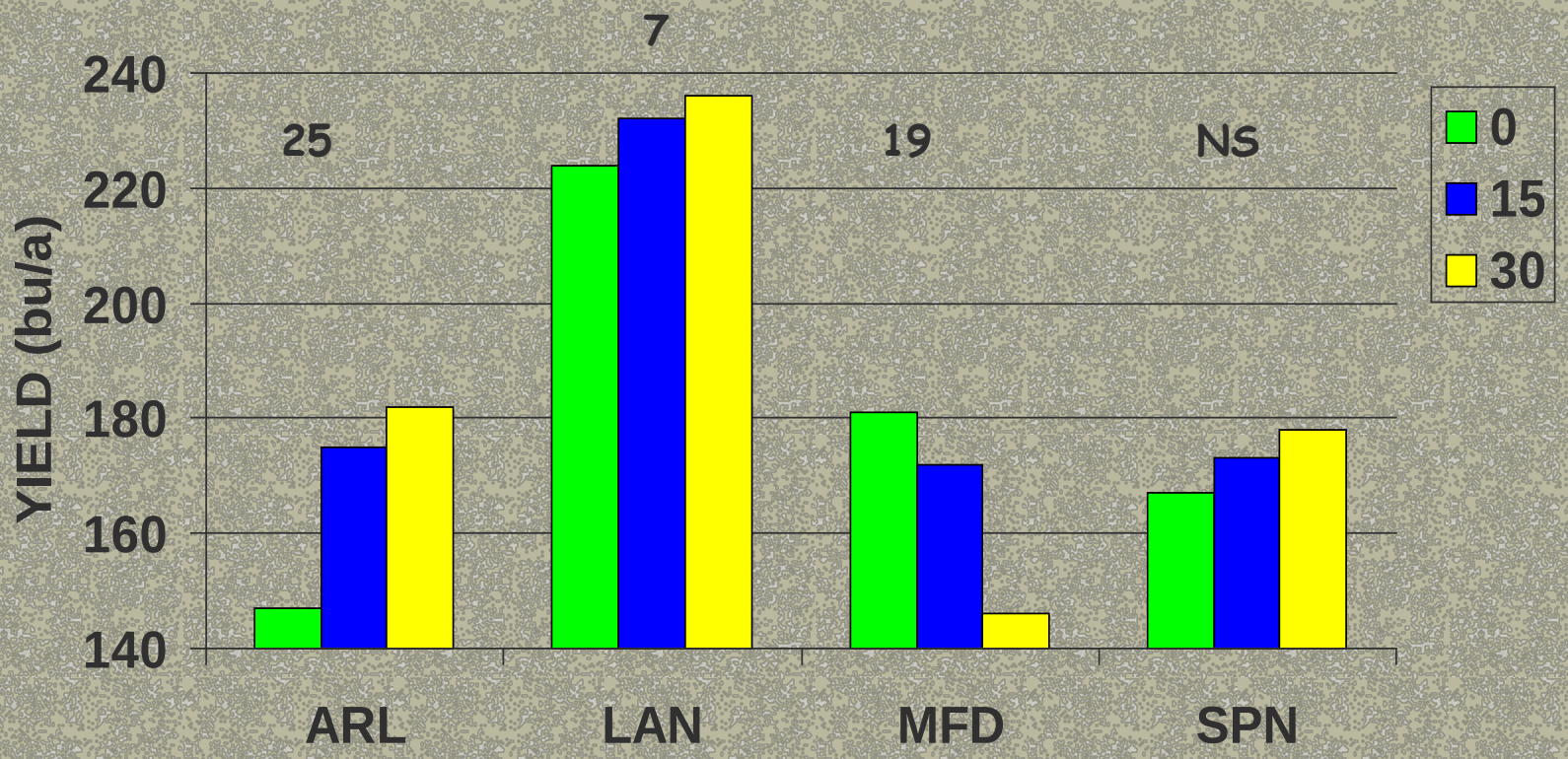


MAIN EFFECT OF MANURE RATE ON CORN YIELD, 2002



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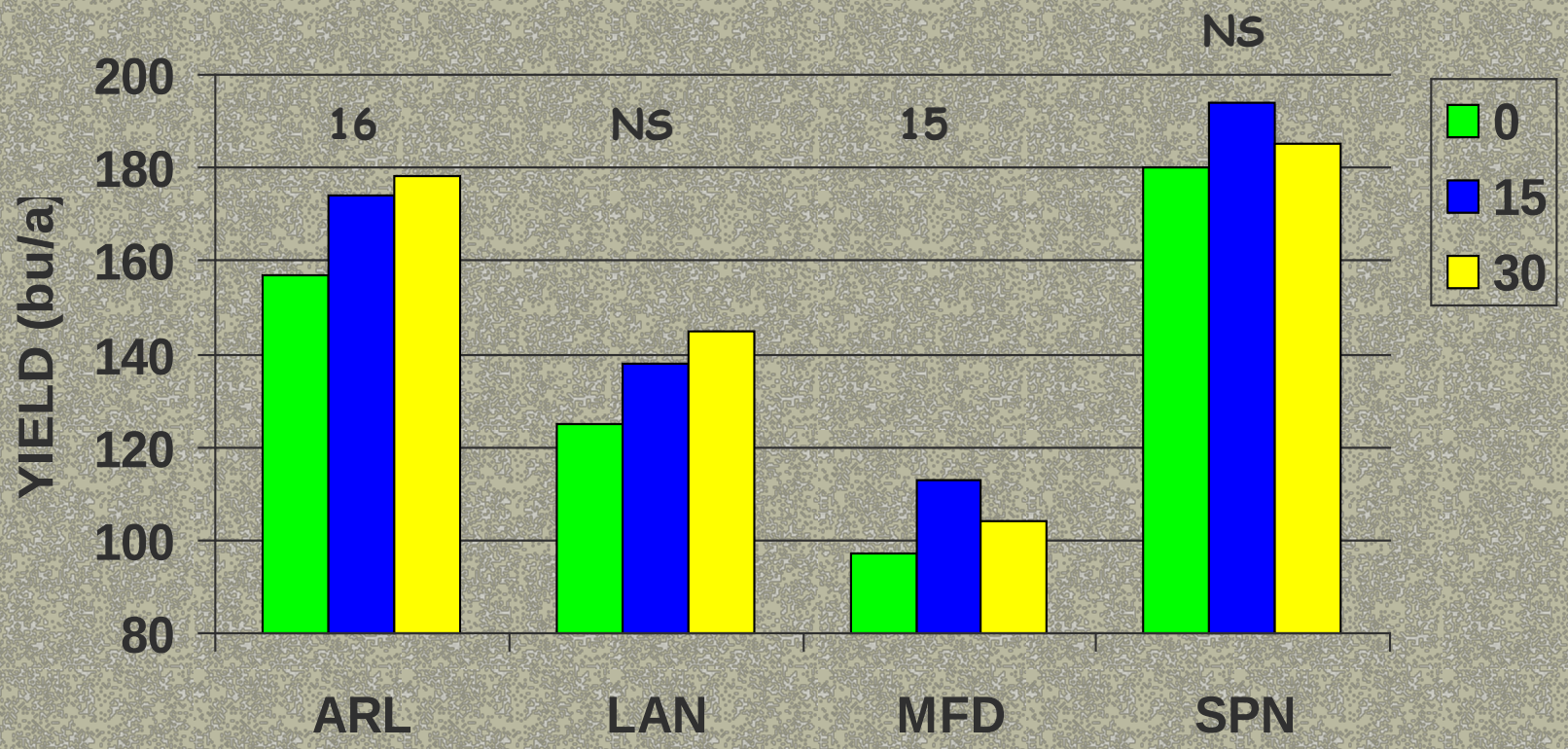

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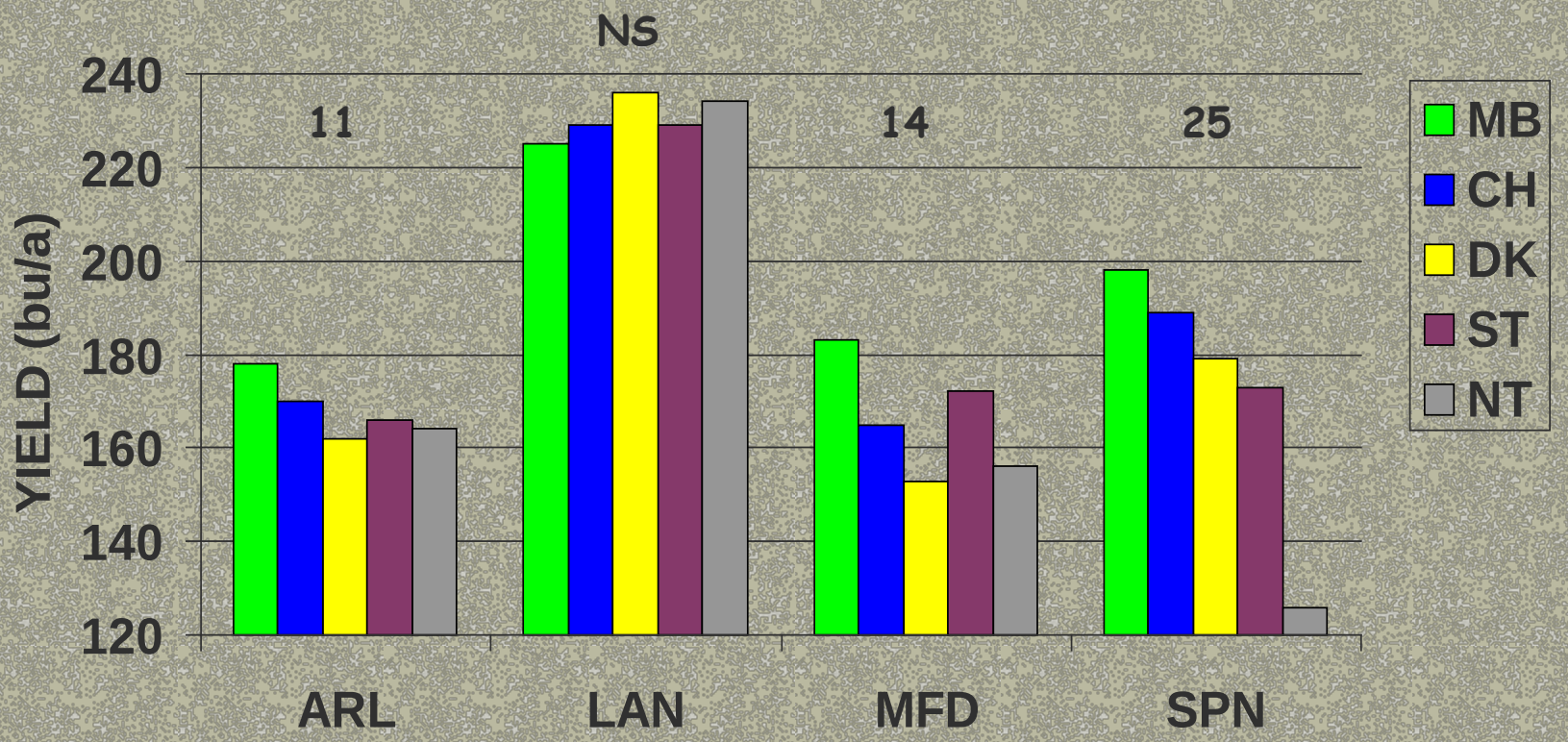

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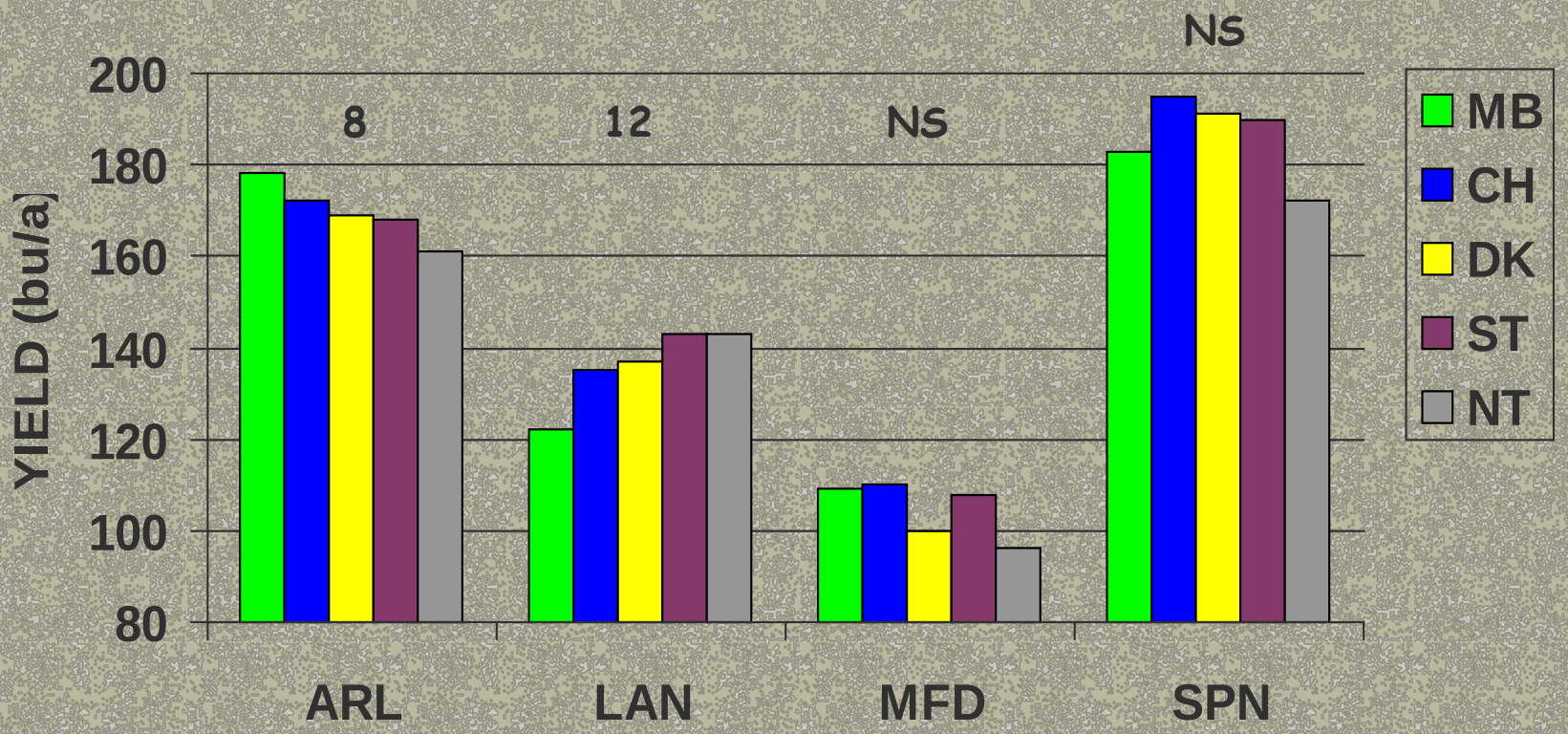
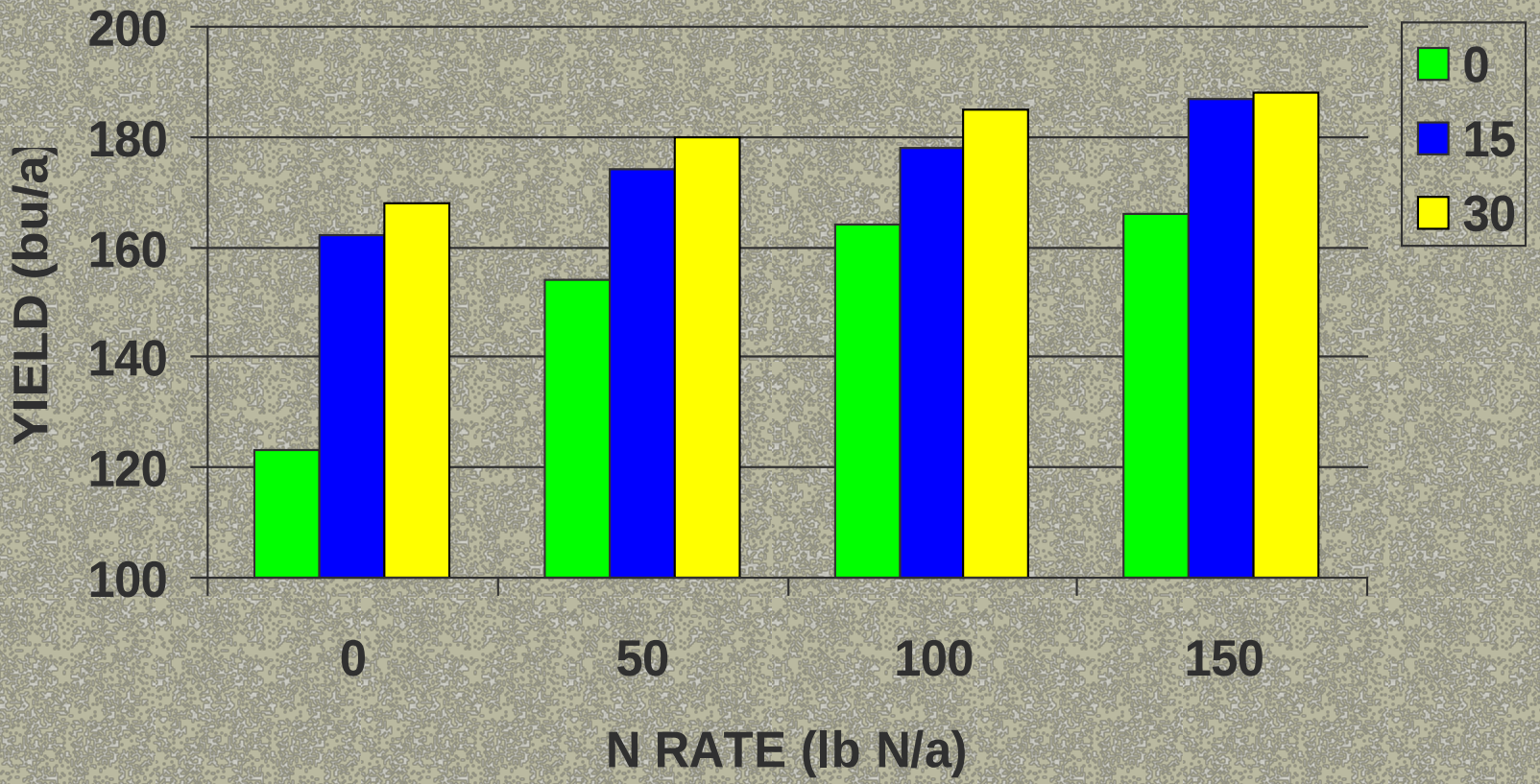


INTERACTION BETWEEN N RATE AND MANURE RATE AT ARLINGTON, WIS., 2002-2003 (2 YR. AVG.)



Pr>F <0.01 in both years

MANURE MANAGEMENT IN REDUCED TILLAGE SYSTEMS

- DO A GOOD JOB OF APPLICATION!
  - APPLY MANURE EVENLY AT KNOWN RATES
  - CONTROL COMPACTION
  - AVOID SPREADING NEAR CHANNELS OR WATERWAYS
- MANURE ADDS RESIDUE AND AFFECTS TILLAGE EFFICIENCY
- EMERGENCE SLOWED AND STAND REDUCED WITH MANURE
- EQUIPMENT AND MANAGEMENT VARIABILITY AFFECT YIELD
- BENEFITS OF MANURE APPLICATION GO BEYOND NUTRIENT SUPPLY